# The Glass Industry

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# Specifications and Standard Methods for Testing Lime-Flint Glass*

By ARTHUR E. WILLIAMS†

The development of standard methods for testing glass articles is a rather neglected field. As is the case of many other articles, this is probably owing to the purchase of glass articles on a basis of price and appearance, rather than on a basis of utility. As soon as there is a general desire to buy articles according to some standard set of requirements which will insure maximum utility at reasonable cost, then the question of service becomes a factor in the selling of goods and the preparation of standard methods of testing such goods immediately becomes necessary.

Tests for determining the physical and chemical properties of different kinds of glass can in most cases be made standard for all types; but tests for glass articles must show the suitability of the article for the service it is made to render. Government departments purchasing large quantities of glass tumblers have agreed that their standardization so that all will use the same type, purchased under a single definite intelligible specification, will attract bidders and eliminate unsuitable goods. They have therefore availed themselves of the services of the Bureau of Standards for the preparation of specifications for the preferred type of glass tumbler.

A study of the requirements of the service developed the information that a specification for this article, in order to be definite and unmistakable and to discriminate between suitable and unsuitable goods, should cover the following points:

1. The type of glass required, whether lead glass or lime glass.
2. The suitability of tank glass and pot glass.
3. Whether a hand finished article is essential.
4. Whether both hand made and machine made tumblers are admissible.

The specification should also prescribe test requirements to determine whether tumblers submitted or supplied have the following qualities:

1. Ability to preserve a good appearance in service.
2. As much strength as is feasible in the style of tumbler adopted.
3. Sufficient annealing to provide against sensitiveness to light blows and reasonably sudden temperature changes.

In common with specifications for many other articles, they must also provide dimensions and a statement as to the tolerances in these dimensions.

After studying both the requirements of the service and the properties of the tumblers on the market, specifications were prepared. These were submitted for criticism to manufacturers and to the Government departments which purchase this article in large quantities. After revision, they were adopted by all Government departments interested. An inspection of these specifications, which follow, shows that the tests provided are simple and easily made. It is believed that they discriminate between acceptable and unsuitable tumblers in all points except appearance. This depends largely on a good fire polish and reasonably good color. Experimental work for the development of tests for these qualities is described following the specifications.

## Specifications for Lime Flint Glass Tumblers

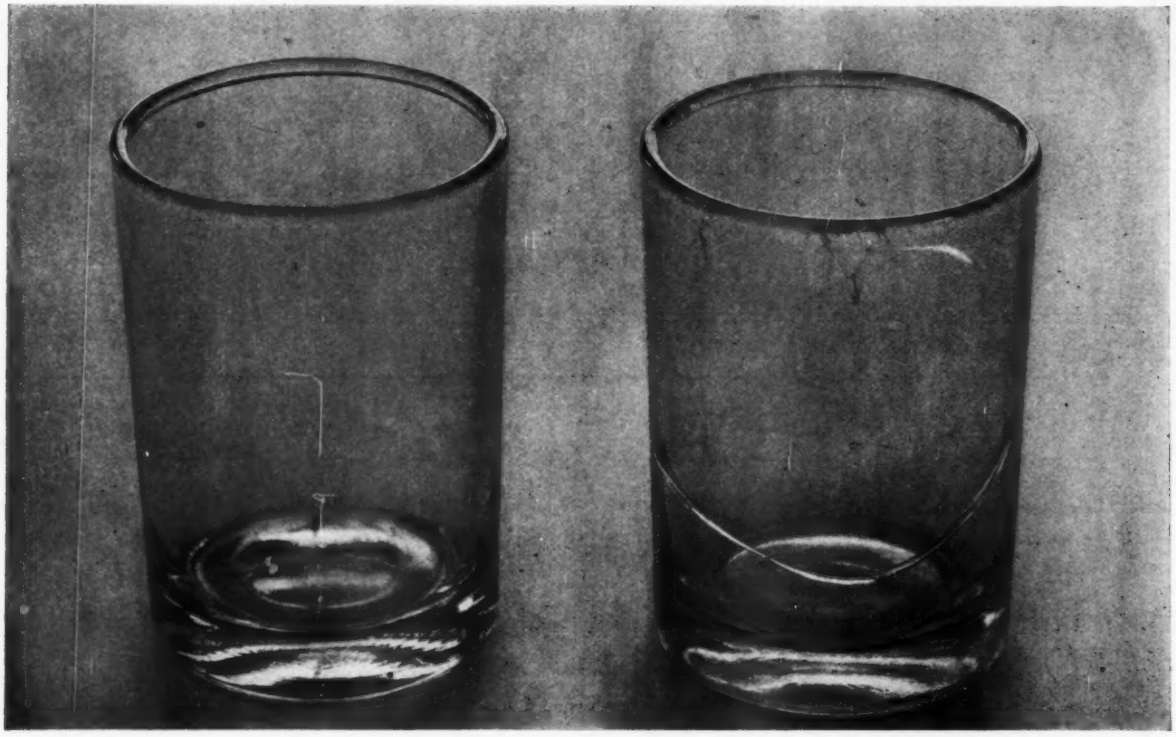
### Designation

The material desired according to these specifications is a plain pressed hotel tumbler made from what is generally known as a lime flint glass.

### Measurements

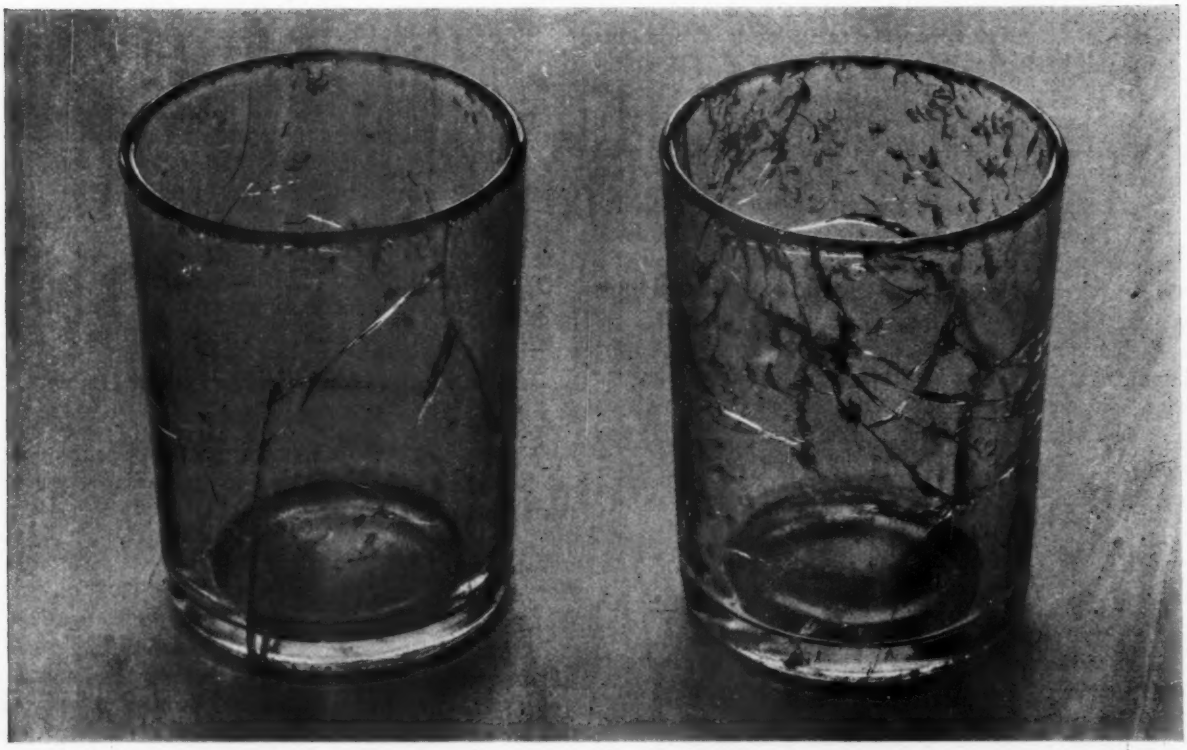
The capacity of these tumblers shall be 10 fl. oz., weight 12 av. oz., height 4¼ in., outside diameter at top 2⅞ in., at bottom 2¾ in. Tumblers shall be non-nesting, shall be slightly rounded at the inside of bottom, have a recessed bottom 5/16 in. thick at the center forming a foot with a thickness of ½ in. on the side. The foot shall be smooth and level and the tumbler shall be lettered in relief (.....) on underside of bottom.

*By permission of the Director, Bureau of Standards, Washington, D. C.
†Glass Section, Bureau of Standards, Washington, D. C.



*No. 1. After a 6-hour boiling test* *No. 2. After a 12-hour boiling test*

FIG. 1. TUMBLERS OF GOOD QUALITY



*No. 3. After a 6-hour boiling test* *No. 4. After a 12-hour boiling test*

FIG. 2. TUMBLERS OF POOR QUALITY

### MATERIAL

Tumblers may be made of either pot or tank lime flint glass, may be either hand or machine made, and may be hand or machine fire polished.

### QUALITY

Glass showing faint color or showing a few scattered bubbles (not larger than .05 in. in diameter) is admissible if such defects do not damage the appearance of the article. Glass shall be fire polished enough to eliminate dullness of the surface.

Samples picked at random from shipments to be acceptable shall be free from stones, cords and fine cracks. They shall be so well annealed that they will withstand the quenching test described below and be reasonably insoluble in water so that they will withstand the boiling test described below.

### TOLERANCES IN SIZE AND WEIGHT

Tumblers may vary in size and weight but shall not have less than the minimum or more than the maximum sizes indicated in the following table:

| | Minimum | | Maximum | |
|---|---|---|---|---|
| | U. S. Customary | Metric | U. S. Customary | Metric |
| Capacity | 9.7 fl. oz. | 287 cm.³ | 10.3 fl. oz. | 305 cm.³ |
| Weight | 11.3 av. oz. | 320 g. | 12.7 av. oz. | 360 g. |
| Height | 4.15 in. | 105 mm. | 4.35 in. | 110 mm. |
| Outside diameter at top | 2.80 in. | 71 mm. | 2.95 in. | 75 mm |
| Outside diameter at bottom | 2.70 in. | 69 mm. | 2.85 in. | 72 mm |
| Thickness of bottom at side | 0.40 in. | 10 mm. | 0.60 in. | 15 mm. |
| Thickness of bottom at center | 0.25 in. | 6 mm. | 0.40 in. | 10 mm. |

### METHOD OF TESTING

*Shock Test:* Boiling water shall be poured into the sample at room temperature (20 to 25° C) until full. An acceptable tumbler must not crack when subjected to this test repeated five times.

*Boiling Test:* Tumblers, when completely immersed in distilled water in a closed vessel having a small steam vent, and boiled continuously for six hours (water being occasionally added to compensate for evaporation losses), shall show no signs of corrosion, scumming, chipping, or cracking.

### ACCEPTANCE

A shipment shall be acceptable if at least 95% of the samples tested pass all the tests and comply with the specifications for size and weight.

### SAMPLING

In shipments of 20 barrels or less two tumblers shall be selected for test from each barrel.

In shipments of from 21 to 50 barrels one tumbler from each barrel shall be selected for test.

In shipments of more than fifty (50) barrels the shipment shall be sampled in groups containing an equal number of barrels but not to contain more than fifty barrels, and each group shall be accepted or rejected according to the resulting tests on samples from that group.

Life and appearance are the two important factors involved in choosing a tumbler for dining room and hospital service. Assuming that good appearance is not incompatible with good strength, it is necessary only to provide tests which assure a good average life for this kind of ware.

In establishments using modern dish-washing apparatus, the life of tableware depends mainly on its resistance to rough handling before and after washing in the kitchen and in service in the dining room. Strength to resist blows is therefore the chief requirement to insure long life. This strength depends on the design of the article, the composition of the glass, and annealing.

The apparatus used in testing tumblers for resistance against impact consisted of a steel hammer operated like a pendulum which was allowed to strike the tumbler repeated blows of increasing force until a break occurred. Tumblers were struck on the heavy part of the foot and on the side one inch from the top, after being placed in a wooden frame which held them solidly against a very heavy iron block. These tumblers were all of the hotel type varying from 9½ to 12 oz. in weight, and from 10 to 11 oz. in capacity. Their resistance to blows varied from 1.7 ft. pounds to 3.5 ft. pounds when struck on the foot and from 0.3 ft. pounds to 1.5 ft. pounds when struck on the side, which is equivalent to saying that a 12 oz. tumbler of the style tested will withstand a fall of from 2 ft. 3 in. to 4 ft. 7 in. to a cement floor if it lands on the foot, as it does in the greatest percentage of cases. There was a more or less marked division of strength at 2.5 ft. pounds for tumblers when struck on the foot. Their strength either fell somewhat below or considerably above this point.

An attempt was made to correlate the design of the tumbler with the strength by taking the cross sectional area of the foot, including the side portion extending one inch from bottom up and the bottom portion extending one inch toward the center from the outside edge. These areas varied from .44 to .55 sq. inch and there seemed to be no direct relation between area and strength. Tumblers having a heavy foot but a thin side showing little taper at the bottom were weak as compared with those whose sides were thicker at the shoulder and tapered from bottom to top. Bottom thickness varied from 9 to 15 mm., showing no definite relation to strength. The strength of the tumblers tested shows a closer relation to composition than to any other factor.

Glass of improper composition shows undesirable properties other than low strength, such as high solubility, which in turn may cause an article to lose its polish, to spall or even crack in the dish washing.

Glasses were tested for solubility by boiling in distilled water for periods of 3, 6, 12, 24, and 48 hours. The results showed some variation in their resistance to disintegration. Some showed slight spalling after three hours, others after six hours and all developed slight chips or spalls after 12 hours. At the end of 48 hours the surfaces of all were rather badly chipped and in many cases the article had fallen to pieces.

Glass which has low strength and a tendency to crack easily also disintegrates rather rapidly in boiling water. In such an article, six hours boiling will produce chipping or spalling, scumming and sometimes cracking. With soda lime glasses within the limits of composition used in tumbler manufacture, a boiling test will therefore separate the glasses

of low strength from those of high strength, and also disclose any tendency to chip and lose their polish.

Fig. 1 illustrates the effect of boiling in water on tumblers of good quality and those of poor quality.

Numbers 1 and 2 are taken from the same set of tumblers and boiled 6 and 12 hours, respectively. These tumblers pass the test and show up well in point of strength. Number 1 shows no indication of any form of disintegration, and Number 2 shows that continued boiling will finally start spalling and cracking, the spalling being evident just below the rim.

Numbers 3 and 4 taken from another group of tumblers show the effect of boiling 6 and 12 hours, respectively, on a glass of poor quality and low mechanical strength. These tumblers could not pass the test and would undoubtedly show a shorter life in service.

Poor annealing, causing spontaneous breakage, may be due to two causes: first, improper lehr control, the cause usually attributed to poor annealing, and second, poorly melted and non-homogeneous glass, a cause rarely given proper attention.

In either case the tendency to spontaneous breakage under ordinary slight shocks or simply while standing in storage can be determined to a great extent by the shock test described in the specifications. If 10 per cent of the ware tested fails under such a test, strained or non-homogeneous glass will be found in the majority of pieces.

Tests have shown that hotel tumblers and in most cases even thin blown tumblers will not stand the shock of being transferred from boiling water to ice water, but break during the first immersion in the ice water. Transferring tumblers from water at 70° C. to ice water causes breakage in all cases after three or four immersions. Transfer from boiling water to tap water is about as severe as simply filling the cold article with boiling water, under which conditions articles subject to spontaneous breaking or cracking during washing will be discovered. Transferring an article from hot to cold water will cause breakage much oftener than transferring from cold to hot.

Thus the tests recommended, although simple and requiring little equipment, will reveal tumblers which may break under ordinary handling, or which may chip or become dull and greasy in appearance, and permit the selection of those which break only from a severe blow and will maintain a good finish. These tests, together with a design properly proportioned, should assure an article having maximum utility without involving higher cost of production.

# Glass Technologists Discuss Their Problems

## Good Attendance of Glass Division Members at the Annual Meeting of the American Ceramic Society —Interesting Papers Presented and Discussed

**Reported for *The Glass Industry* by J. H. FORSYTH***

The opening day of the twenty-fourth annual convention of the American Ceramic Society found several hundred chemists, engineers, manufacturers and others interested in the ceramic industries gathered at St. Louis, Mo., for their customary annual reunion. On Monday, February 27, at the general sessions at the headquarters, Hotel Statler, the visitors were welcomed to St. Louis by Mayor Henry W. Kiel. The address of the retiring president, Forrest K. Pence, was delivered; the reading of reports took place, and addresses and papers on subjects of general interest to ceramists in all branches were delivered, including contributions by E. W. McCollough, G. W. Greenwood. C. W. Parmelee, E. W. Washburn, E. N. Bunting, B. A. Rice, Louis Navias, and Kurd Endell.

F. H. RIDDLE
President, 1922-1923

The election of officers for the year 1922-1923 resulted as follows:

President, F. H. Riddle, Champion Porcelain Co., Detroit, Mich.

Vice-president, E. Ward Tillotson, assistant director, Mellon Institute, Pittsburgh, Pa.

Treasurer, R. K. Hursh, University of Illinois, Urbana, Ill.

Trustee, B. E. Salisbury, Onondaga Potteries, Syracuse, N. Y.

The other members of the Board of Trustees for the coming year are: R. C. Purdy, Columbus, O., General Secretary; R. H. Minton, General Ceramics Co., Metuchen, N. J., Trustee; F. K. Pence, Knowles, Taylor & Knowles, East Liverpool, O., Trustee; R. M. Howe, Mellon Institute, Pittsburgh, Pa., Trustee.

On Monday evening a smoker and entertainment was held and on Tuesday the general meetings were continued and the meetings of various divisions began. On Wednesday, March 1st, the register showed the following number of visitors in attendance from the Society's total membership of one thousand five hundred seventy-five.

| | |
|---|---|
| Enamels Division | 87 |
| Refractories Division | 82 |
| Heavy Clay Division | 67 |
| White Ware Division | 65 |
| Glass Division | 52 |
| Terra Cotta | 33 |
| Art Division | 18 |
| Total | 404 |

There was a large attendance at the banquet on Tuesday night, February 28, and the affair was thoroughly enjoyed by those present.

An abstract of the address of E. W. McCollough, manager, Fabricated Production Department, Chamber of Commerce of the United States of America, delivered at the general sessions on Monday, follows:

*Associate chemist, National Lamp Works of General Electric Company, Cleveland, O.

### Reduction in Varieties of Manufactured Products

By E. W. McCOLLOUGH

By reducing variety of product the manufacturer gains:

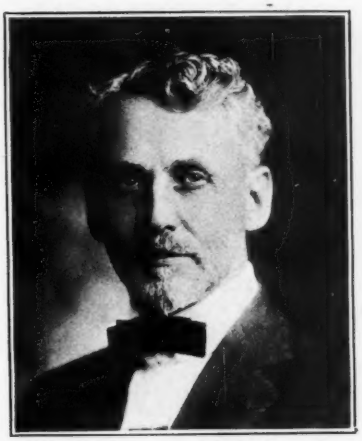
(1) Less capital tied up in
- a—Raw materials.
- b—Semi-finished stock.
- c—Finished stock.
- d—Jigs, dies, templates and special machinery.
- e—Finished stock.
- f—Repair parts.

(2) More economical manufacture through:—
- a—Larger units of production—reduced number of manufacturing units.
- b—Longer runs—less frequent change.
- c—Higher rate of individual production.
- d—Accurate and proper estimating for production
- e—More effective stock control.
- f—Better and more simplified inspection.
- g—Less idle equipment: reduced amount of equipment.
- h—Greater ease in securing raw materials and conserving raw products.
- i—Cheaper handling of stock.
- j—Reduced clerical overhead.
- k—Simplified and more accurate cost system.
- l—Elimination of waste in experimentation and design.
- m—Standardized material inventories.

(3) More efficient labor due to:
- a—Making training of employees more simple.
- b—Better earnings, through increased individual production made possible by longer runs.
- c—Happier and more contented workmen.
- d—Skill increased by repetitive process.
- e—Less labor idle from preventable causes.
- f—More permanent employment as contrasted to present seasonal employment.

## Officers of American Ceramic Society, 1922-1923

VICE-PRESIDENT, E. WARD TILLOTSON



GENERAL SECRETARY, ROSS C. PURDY

TREASURER, R. K. HURSH

## Newly Elected Glass Division Officers

Balloting for officers of the Glass Division for the coming year resulted as follows: Chairman, J. C. Hostetter, Corning Glass Works, Corning, N. Y.; vice-chairman, A. R. Payne, Hazel-Atlas Glass Company, Clarksburg, W. Va.; secretary, A. E. Williams, Bureau of Standards, Washington, D. C.; councillors, H. W. Hess, consulting chemist, Toledo, O., and J. W. Wright Macbeth-Evans Glass Company, Charleroi, Pa.

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Recommended Specifications for Limestone, Quicklime and Hydrated Lime for Use in the Manufacture of Glass, Bureau of Standards Circular, No. 118, was adopted as tentative standard specifications.

No tentative specifications for refractories were adopted. They were referred back to the committee.

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The Tuesday meetings of the Glass Division developed some interesting papers and discussions, some of which are reported below. J. C. Hostetter was acting chairman, and J. H. Forsyth, acting secretary.

### The Passing of King Methane

By S. R. SCHOLES, Read by W. A. Yung

Forty years ago there was always great disappointment when the hopeful driller for petroleum struck a pocket of natural gas. Twenty years later, natural gas had become the standard glass-house fuel. The gas belt also became the glass belt.

Today the price of natural gas, except in favored localities, is almost prohibitive for the manufacturer. Moreover, for several years past, the gas has been low in supply in cold weather. Thus in less than four decades the most ideal of all industrial fuels has run its course from a nuisance to a luxury.

Of all the materials stored in the bosom of Mother Earth for her human sons to find and use, none other seems so ideally adapted to the caloric needs of man as natural gas. It is clean and dustless and almost odorless. For glass furnaces it is ideal, no other word describes it. But all of these encomiums might almost be written in the past, so far as the glass manufacturer is concerned. Oklahoma and other western states are developing gas fields, but they are too far from the centers of population to be industrially important.

Producer gas during the failing interval of natural gas has been so well developed that now the furnace can count on a steady flow of gas approximating 140 b. t. u.'s per cubic foot.

It is a difficult matter to bring up a cold furnace with this gas, but when once the regenerator checkers are heated, the maintenance of constant high temperature is only a matter of care. One drawback is burn outs once a week. Apparently the soot and tar are actually desirable to give the flame of producer gas a luminous character so that it will radiate more heat upon the glass in tanks than would the non-luminous flame of the clean gas whose principal fuel component is carbon monoxide. Coal

ANNUAL BANQUET OF THE AMERICAN CERAMIC SOCIETY

Held on Tuesday Evening, February 28, 1922, in Connection with the Annual Meeting, at Hotel Statler, St. Louis, Mo.

gas from by-product coke ovens is within the range of possibilities but awaits development.

Fuel oil has reached such an importance that it deserves more than honorable mention. The choice of oil-burning systems may be said to be a matter of individual preference, depending somewhat on the furnace to be heated. In the matter of cost, oil fluctuates rapidly and widely, according to the demand and supply. Therefore, it requires a careful purchasing agent to keep a factory supplied with oil at an advantageous price.

The heat balance of a glass tank shows 9.4 per cent efficiency upon using assumptions which are admittedly conservative; 21.4 per cent goes up the stack—assuming stack gases of 600° F. Balance of over 69 per cent is lost by radiation. The item of 69 per cent lost by radiation is a conservative figure. The question arises how this enormous loss may be cut down or how the meager efficiency of the glass furnace case be raised.

Heat insulation is impossible as the walls and crown of the melting furnace are now right at the limit of their endurance. The time has come when makers of refractories must develop something that will stand up for its usual life in a glass furnace, covered with insulation. Something real must be done to economize fuel.

Another direction in which effort might well be expended toward the saving of fuel is in the design of glass furnaces and tanks. Apparently very little is known as to accurate data on strength of materials, height of crown, best width of tank, length of melting end, etc., for a given tonnage. No demonstrated standards are to be found.

This should not be so, for there are undoubtedly definite principles making for economy of fuel in glass furnaces, and it is time they were established and made known. With true American prodigality, we have already blown into the air, or burned almost all of our treasure of natural gas. And now, with true American inventiveness, we must improve furnace and refractories so as to get far better efficiencies from the burning of King Methane's successors.

DISCUSSION

H. L. Dixon took exception to the statement that the furnace builder had no accurate data on tank and furnace construction. He contended that builders were able to meet the requirements of the glass manufacturer which were usually to deliver a certain quantity of a certain quality of glass per 24 hours.

Not until recently have the manufacturers been interested in any other considerations when ordering a tank. He developed the fact that until only recently had the manufacturers of glass deemed it necessary for them to employ technical help. He recommended the technical men in the glass house and was always pleased to work with them and gave them credit in the majority of cases for the work of the development of the construction of tanks and furnaces. This was illustrated by a masterful description of the mistakes and ignorance displayed by the operators in the first attempts to melt a flint glass in tank furnaces.

Mr. Dixon was of the opinion that great saving of heat wastes can be accomplished by better refractories and that this part of the work is strictly up to the manufacturers of those products.

## A Note on the Effect of Manganese in Glass of Melting at Reduced Pressure

By E. N. BUNTING

Mr. Bunting showed a piece of flint glass which had been melted in an electrically-wound furnace under a vacuum. The glass was not completely plained up as at a high vacuum the heat transfer from the winding was so small that the winding was burned up. The piece showed the pink color due to manganese at the bottom of the crucible. The metal line of the glass contained all the gas and was free from color. No definite cause was assigned for this phenomenon except perhaps that the gases withdrawn by the vacuum present were reducing in nature and had reduced the manganese. The glass used was a lead bulb glass furnished by the General Electric Company.

## Pot Arches

By C. E. FRAZIER

No paper had been prepared but Mr. Frazier started a lively discussion in regard to heating of pots in the arch. The outcome of which was the consensus of opinion that the operation of melting glass for plate glass manufacture did not require that the pots be arched to a temperature equal to the melting temperature of the glass. This point is only necessary when the pot is set in a furnace whose temperature remains constantly at melting temperature, a condition which does not exist in the usual plate glass melting operation.

## A Small Glass Tank

By H. T. BELLAMY

A small glass melting tank using three surface combustion burners and having a melting compartment 20 inches wide and 45 inches long was described. Tank was used for small melts on different types of glasses even on some lead glass melts. Operated as a day tank.

The first construction had a silica brick crown. This gave trouble due to erosion by gases at high temperatures and spalling due to intermittent service required. Tank was then constructed with a crown composed of a comparatively new composition brick supplied by the Norton Company. This brick was made of zirconium silicate. These bricks gave no trouble whatever and after a year of service could be removed from the furnace and a new crown rebuilt with them. Erosion was eliminated and spalling due to heating up or cooling down or cracking was never encountered.

A lively interest was shown in the discussion. All the users of tanks and builders were anxious to give this new material a trial. Some disadvantages, however, were pointed out. First, the material is only in a comparatively experimental stage of development; second, the density is about twice that of silica bricks; and third, the cost of the material is very high.

Instead of presenting a paper on the ACTION OF VARIOUS GLASSES ON POTS, J. W. Wright gave his ideas regarding a paper he had in mind, in which would be discussed the cause of rings in pots making boro-silicate glass throwing stones and lasting only two days at one factory and two weeks at another.

The same batch, raw materials and furnace conditions were present and even the same rings were shipped from the plant obtaining the longest life. He could assign no reason for this and had in mind carrying out tests to determine the cause, but had been unable to do so.

Members of the Section debated the question but no definite reason could be attributed to the case.

## Physical Defects in Tank Blocks

GEORGE A. LOOMIS

Lanterns slides illustrated defects in tank blocks by different makers. Three blocks from each shipment were tested by breaking in cross-sections three inches thick and average conditions were photographed.

All blocks except those from one manufacturer showed pockets and fissures. These blocks were supplied during the war. Discussion followed during which the use of a smaller block was advocated for tank construction. It is apparently very difficult to make a perfect block in large dimensions. Cost of production is too large. Hand made blocks can be made nearly perfect but higher skilled workmen are required and production is low, making the cost prohibitive.

The consensus of opinion brought out by the discussion was that other factors besides fissures and pockets enter into the life of tank blocks, but that a process of manufacture which eliminates these particular defects is one step forward in the production of a better block, other factors being equal.

One glass manufacturer reputed to have the record for tank

life in this country attributed his success largely to a long heating up period when firing up the tank and to fundamental changes in design.

## Discussions

FINE OR COARSE GROUND MIXTURES FOR CHECKER BRICK IN GLASS FURNACES.—No one present was prepared to answer this question definitely but all practical experience seemed to indicate that there is no reason why a finely ground mixture for checker brick should not be far superior to a coarse ground mixture.

WATER COOLING OF GLASS TANKS.—Water cooling must be balanced against fuel, cost of refractories and repairs and loss of production, together with the cost of water, cooling and pumping. Some hard water would be dangerous to use on account of the deposit of scale and the subsequent insulation. It is absolutely essential that good contact be made between the cooler and the blocks.

First class installations are in use with success at the points most likely to fail, but general cooling has not been universally adopted, being a comparatively new method of procedure. No definite endorsement could be made as the method is still in the progress of development. A better quality of refractories would obviate the use of water coolers entirely.

BEST TYPE OF CROWNS TO BE USED OVER GLASS TANKS; KEYED ARCHES, SUSPENSION OR DOUBLE SUSPENSION.—It was stated that the tanks with flat crowns have been designed but none erected.

WHY ARE OPEN POTS USED IN EUROPE AND NOT IN THE UNITED STATES?—Due to a different manner of working, open pots are used abroad but not in this country. Lead glass can be melted in open pots with success but they demand a method of working which we have not established.

ELIMINATION OF STREAKS IN WHITE OPAQUE GLASS.—No method of elimination given.

EFFECT OF BATH COMPOSITION AND MELTING PROCESSES ON COEFFICIENT OF EXPANSION.—Not known.

POSSIBILITIES OF HAVING RECORDS OF EACH INDUSTRIAL GLASS RESEARCH LABORATORY SYSTEMATICALLY EXAMINED WITH VIEW TO ABSTRACTING DATA OF VALUE AND PUBLISHING THE SAME.—This is becoming more and more a possibility and may be attained in the near future.

Reviews of other papers and reports of the discussions following them and other convention activities not received in time for insertion in this number of THE GLASS INDUSTRY will be printed in the April issue.

## Some of Those Present

A list of members attending the Glass Division meetings follows:

H. T. Bellamy, Western Electric Co., Chicago, Ill.
Henry W. Hess, Toledo, O.
J. C. Holmes, Edison Glass Division of General Electric Co., Sandusky, O.
E. N. Bunting, University of Illinois, Urbana, Ill.
G. Percy Cole, Dominion Glass Co., Ltd., Montreal, Canada.
H. L. Dixon, H. L. Dixon Co., Pittsburgh, Pa.
F. M. Moss, Edison Lamp Works of General Electric Co., Harrison, N. J.
Geo. A. Loomis, Ohio Valley Clay Products Co., Steubenville, O.
Wm. Lippert, Adolphus Busch Glass Co., St. Louis, Mo.
Walter J. Knothe, Russell Engineering Co., St. Louis, Mo.
William W. Anlepf, Russell Engineering Co., St. Louis, Mo.
H. T. Goodman, Bartlett-Collins Glass Co., Sapulpa, Okla.
A. S. Zopfi, Buckeye Clay Pot Co., Toledo, Ohio.
A. H. Chandler, Refractories Dept., Pittsburgh Plate Glass Co., Pittsburgh, Pa.
C. E. Fulton, Refractories Dept., Pittsburgh Plate Glass Co., Pittsburgh, Pa.,
J. S. Herzog, The Thompson Foundry & Engineering Co., Newark, O.
Wilbur F. Brown, Libbey-Owens Sheet Glass Co., Charleston, W. Va.
H. H. Blau, Macbeth-Evans Glass Co., Pittsburgh, Pa.
Geo. W. Parker, Russell Engineering Co., St. Louis, Mo.
Chas. O. Grafton, Gill Clay Pot Co., Muncie, Ind.
W. L. Brownlee, Buckeye Clay Pot Co., Toledo, O.
J. W. Cruikshank, Consulting Engineer, Pittsburgh, Pa.
A. T. Hauser, Woods-Lloyd Co., Pittsburgh, Pa.
H. L. Watson, General Electric Co., Lynn, Mass.
L. A. Perry, Chicago Pottery Co., Chicago, Ill.
J. T. Neenon, Vitralite Co., Parkersburg, W. Va.
A. R. Payne, Hazel-Atlas Glass Co., Clarksburg, W. Va.
A. W. Bitting, Glass Container Association, Chicago, Ill.
A. E. Williams, Bureau of Standards, Washington, D. C.
C. C. Rand, National Lamp Works, Cleveland, O.
J. W. Wright, Macbeth-Evans Glass Co., Charleroi, Pa.
M. A. Atwood, Laclede Christy Clay Products Co., St. Louis, Mo.
R. H. Miller, Farber Brick Co., Farber, Mo.
A. A. Van Cleave, Grand View Fire Clay Mines, St. Louis, Mo.
H. A. Peters, Mississippi Glass Co., St. Louis, Mo.
C. W. Parmelee, University of Illinois, Urbana, Ill.
J. C. Hostetter, Corning Glass Works, Corning, N. Y.
J. H. Forsyth, National Lamp Works, Cleveland, O.

# Bureau of Standards' Recommended Specification for Limestone, Quicklime and Hydrated Lime

### For Use in the Manufacture of Glass*

This is the second of a series of specifications for the lime used in various chemical industries. To assist in the development of these specifications the Bureau of Standards called together an Inter-departmental Conference on Chemical Lime, composed of representatives of the Geological Survey and Bureau of Mines of the Interior Department; the Bureau of Soils, Bureau of Chemistry, Forest Service, and Fixed Nitrogen Research Laboratory of the Department of Agriculture; and the Chemical Warfare Service of the War Department. The present specification, based on a draft originally prepared by A. E. Williams of the glass section, Bureau of Standards, has been unanimously approved by the above conference and has been adopted as tentative by a majority vote of the Standardization Committee of the Glass Division of the American Ceramic Society.

*Circular No. 118, Bureau of Standards, December 8, 1921.

#### 1—GENERAL.

(*a*) USE OF LIME IN MAKING GLASS.—Most common glasses are fused mixtures of alkali (usually soda), alkaline earth (usually lime), and silica. Freedom from color is important in determining the quality of glass, which, in turn, depends upon the absence of coloring oxides (usually iron) from the raw material.

Limestone, quicklime, or hydrated lime may be used for making glass. The decision as to which to use is generally based on availability, cost, and present practice.

(*b*) DEFINITION OF LIMESTONE, QUICKLIME, AND HYDRATED LIME.—Limestone consists essentially of calcium carbonate, or of calcium and magnesium carbonates where the amount of the latter does not exceed 45.5 per cent. Quicklime is the product resulting from the calcination of limestone and consists essentially of calcium oxide, or of calcium and magnesium oxides. It will slake when water is added to it, and this slaking is accompanied by an evolution of heat and an increase in volume. Hydrated lime is a dry powder which is made by treating quicklime with enough water to satisfy its chemical affinity under the conditions of manufacture. It consists essentially of calcium hydroxide, or of a mixture of calcium hydroxide and magnesium oxide or hydroxide.

(*c*) PACKING.—Limestone is shipped in bulk in carload lots, or in cloth or paper bags. Quicklime is shipped either in bulk in carload lots or barrels holding 180 pounds net or 280 pounds net each. Hydrated lime is shipped in paper bags holding 50 pounds net each.

## 2—REQUIREMENTS.

(*a*) QUALITY.—Except for the constituents enumerated below, the composition of a limestone, lime, or hydrated lime may vary within wide limits and still be satisfactory to the glass manufacturer. Either high calcium or high magnesium material may be used. It is essential, however, that the composition be reasonably uniform from day to day. Otherwise the difficulty of controlling the process of manufacture would become too great.

(*b*) COMPOSITION.—Quicklime shall not contain more than 3 per cent $CO_2$ as shipped. Hydrated lime shall not contain more than 5 per cent $CO_2$ as shipped, and shall contain sufficient water to meet the chemical requirements of the calcium oxide.

Limestones, quicklimes, and hydrated limes may be divided into three classes, depending upon the character of glass for which they are suitable. To meet these specifications, the constituents listed below shall not exceed the maximum percentages nor fall below the minimum percentages given in the following table:

TABLE I.—Composition of the Nonvolatile Portion of Limestone, Quicklime, or Hydrated Lime

| | Class 1 | | Class 2 | | Class 3 | |
|---|---|---|---|---|---|---|
| Ingredients | Maximum | Minimum | Maximum | Minimum | Maximum | Minimum |
| CaO+MgO | .... | 96 | .... | 91 | .... | 83 |
| Ferric oxide | 0.2 | .... | 0.4 | .... | 0.8 | .... |
| Sulphuric and phosphoric anhydrides | 1.0 | .... | 1.0 | .... | 1.0 | .... |
| Silica | 4.0 | .... | 9.0 | .... | 17.0 | .... |
| Alumina | 3.0 | .... | 5.0 | .... | 5.0 | .... |

The sum of the calcium and magnesium oxides is specified in the above table. In order to prevent undue variation in the relative proportions of these two ingredients the per cent calcium oxide shall be established by contract, and it is specified that the per cent calcium oxide shall not vary more than 2 per cent either way from the contract figure.

An approximate figure for the content of alumina should also be included in the contract. This figure must come within the limits set in the above table, and it is specified that the amount of alumina in the material delivered shall not vary more than 1 per cent either way from the contract figure.

(*c*) FINENESS.—Unless otherwise specified, limestone, quicklime, and hydrated lime shall be crushed so that all will pass a No. 16 sieve.

NOTE.—A No. 16 sieve has an opening of 1.19 mm and a wire diameter of 0.54 mm, with a permissible tolerance of 2 per cent in the opening and 10 per cent in the wire diameter.

(*d*) MARKING.—Each carload of material, or fraction thereof, shall be legibly marked with the names of the consignor and consignee, and with some means of identifying the particular contract on which the shipment is made.

This information is in addition to that required by the Federal lime-barrel law.

(*e*) RETESTING.—Notice of the rejection of a shipment based on these specifications must be in the hands of the consignor within 10 days after the receipt of the shipment at the point of destination. If the consignor desires a retest, he shall notify the consignee within 5 days of receipt of the notice of rejection. The consignee shall provide all reasonable facilities to permit the consignor to resample the material. This retest shall be at the expense of the consignor.

## 3—SAMPLING AND TESTING.

(*a*) SAMPLING.—The purchaser will bear all expense of sampling and testing. When limestone or quicklime is shipped in bulk, the sample shall be so taken that it will represent an average of all parts of the shipment from top to bottom, and shall not contain a disproportionate share of the top and bottom layers, which are most subject to changes. The sample shall consist of 1 shovelful for each 3 tons of material, but not less than 10 shovelfuls, taken from different parts of the shipment. The total sample taken shall weigh at least 100 pounds, shall be mixed thoroughly, and "quartered" to provide a 15-pound sample for the laboratory. In case a shipment consists of more than one car, a separate sample shall be taken from each car.

When quicklime is shipped in barrels, at least 3 per cent of the number of barrels shall be sampled. They shall be taken from various parts of the shipment, dumped, mixed, and sampled as specified in the above paragraph.

In the case of hydrated lime, the sample shall be a fair average of the shipment. Three per cent of the packages shall be sampled. The sample shall be taken from the surface to the center of the package. The material so obtained shall be thoroughly mixed and quartered to provide a 2-pound sample for the laboratory.

When sampling quicklime or hydrated lime, it is essential that the operation be conducted as expeditiously as possible, in order to avoid undue exposure of the material to the air. The sample to be sent to the laboratory shall immediately be placed in an air-tight container in which the unused portion shall be stored until the shipment has been finally accepted or rejected by the purchaser.

The sample may be taken either at the point of shipment or at the point of destination, as agreed upon by the contracting parties. If it is desired to enforce the requirement as to carbon dioxide, the sample must be taken at the point of shipment.

(*b*) TESTING.—The following directions are a brief summary of the analytical methods which are recommended. For more complete information on this subject references should be made to "The analysis of silicate and carbonate rocks," by W. F. Hillebrand, United States Geological Survey Bulletin No. 700.

Blast 0.5 g of the sample for 15 minutes in a platinum crucible. Cool and transfer to an evaporating dish. Mix to a slurry with distilled water. Add 5 to 10 cc concentrated HCl. Heat gently until solution is complete, breaking up lumps if necessary. Evaporate to dryness on water bath. Add 5 to 10 cc concentrated HCl and dilute with an equal volume of distilled water. Digest on water bath for 10 minutes. Filter and wash with hot water. Evaporate the filtrate to dryness. Dissolve in acid and water as before. Filter, and wash with hot water. Ignite the two precipitates together and weigh as silica and insoluble matter.

Dilute the above filtrate to 250 cc. Add HCl if necessary to insure a total volume of 10 to 15 cc. Make alkaline with $NH_4OH$. Boil until odor of $NH_3$ is barely noticeable. Filter, and wash slightly with hot water. Dissolve the precipitate with hot dilute HCl and repeat the precipitation as before. Filter and wash thoroughly with hot water. Ignite and weigh as oxides of iron, aluminum, and phosphorus.

To the filtrates from the above add a few draps of $NH_4OH$ and bring to a boil. Add 25 cc of a saturated solution of $(NH_4)_2C_2O_4$. Continue boiling until the precipitate becomes granular. Let stand until precipitate settles clear. Filter, and wash with boiling water. Ignite the precipitate, dissolve in dilute HCl, and dilute to 100 cc. Add excess of $NH_4OH$, and boil. Filter out any insoluble matter, ignite and weigh, and add its weight to the oxides of iron and aluminum found previously. To this filtrate add $(NH_4)_2C_2O_4$, proceeding as before. Filter, and wash with boiling water. Ignite, and blast to constant weight as calcium oxide.

Acidify the filtrates from the above with HCl. Evaporate to

150 cc. Add 10 cc of a saturated solution of $NaNH_4HPO_4$ and boil. Cool. Add $NH_4OH$ drop by drop, with constant stirring, until the precipitate starts to form. Then add moderate excess of $NH_4OH$. Stir for several minutes. Let stand overnight. Filter, and dissolve the precipitate in hot dilute HCl. Dilute to 100 cc, add 1 cc of saturated solution of $NaNH_4HPO_4$, and precipitate as before. Filter, and wash with an alkaline solution made by diluting $NH_4OH$ until it contains about 2.5 per cent $NH_3$ and then add a few drops $HNO_3$. Ignite, and weigh as $Mg_2P_2O_7$. Multiply this weight by 0.3621 to find the weight of MgO.

Place 5 g of the sample of quicklime or hydrated lime, or 0.5 g of limestone, in a small Erlenmeyer flask and cover with hot distilled water. Connect this flask into a carbon-dioxide train, set up as follows: Next to the flask is a reflux condenser, to which is connected a calcium-chloride drying tube, followed by a tube containing anhydrous $CuSO_4$, then another tube of $CaCl_2$, then by two tubes filled with soda lime, and finally by another tube of $CaCl_2$. The entire train must be so arranged that a stream of $CO_2$ free air can be kept passing through it. Start this stream of air. Weigh the tubes containing soda lime and replace them in the train. Add to the sample in the flask about 25 cc of 1:1 HCl, being careful that no gas is lost and that the effervescence is not too violent during the operation. When the effervescence diminishes, heat the flask, bringing the liquid gradually to boiling. Boil for 10 minutes. Remove the flame and allow the flask to cool while the stream of air is still flowing, for 15 minutes. Disconnect and weigh the soda-lime tubes. Their increase in weight is recorded as carbon dioxide.

Dissolve 5 g of the sample in HCl and evaporate to dryness. Dissolve the residue in HCl, filter, and wash with hot water. Fuse the residue with $Na_2CO_3$. Treat the filtrate with NaOH in boiling solution, filter, and wash with hot water. Dissolve both this precipitate and the fused residue in dilute $H_2SO_4$. Reduce with Zn and titrate with $\frac{N}{20}$ — $KMnO_4$. Calculate the result to per cent $Fe_2O_3$.

Dissolve 2 g of the sample in 10 cc water and 15 cc 1:1 HCl. Filter out insoluble matter. Dilute filtrate to 250 cc. Heat to boiling and add 10 cc of a boiling 10 per cent solution of $BaCl_2$, drop by drop, with constant stirring. Let stand overnight, filter, wash with hot water, ignite, and weigh as $BaSO_4$. Calculate to per cent $SO_3$.

Dissolve 10 g of the sample in 80 cc of 1:1 $HNO_3$. Filter, wash, fuse the residue with $Na_2CO_3$, dissolve the melt in $HNO_3$, and add this solution to the filtrate. Boil the filtrate with 10 cc of 1.5 per cent $KMnO_4$ solution until $MnO_2$ is precipitated. Add enough $H_2SO_3$ to dissolve the $MnO_2$. Neutralize with $NH_4OH$. Add 1 cc of concentrated $HNO_3$ for every 100 cc of solution. Bring to 40° C and precipitate with ammonium molybdate. Shake for 10 minutes and let stand at 40° C for 12 hours. Filter and wash with 1 per cent $KNO_3$. Dissolve the precipitate in a known volume of $\frac{N}{10}$ NaOH and $CO_2$ free water. Titrate the excess NaOH, using phenolphthalein as indicator. Calculate the per cent $P_2O_5$, using the proportion, P:NaOH = 1:23.

# The Laboratory

By J. B. KRAK

## The Quantitative Analysis of Glass

Several different classifications of the various types of glass have been proposed based on a diversity of factors, such as commercial application[1], methods of manufacture[2], technical use[3] or chemical composition[4]. From the standpoint of the analyst the following division of glasses based upon the increasing complexity of their chemical constitution, may be useful.

Class I. Common glasses, containing in varying proportions: silica, alumina, lime, magnesia, soda, potash or both alkalies. This class embraces structural glass, bottle and Bohemian glass and lime flint.

Class II. Lead glasses, subdivided in (1) crystal glasses, containing silica, lead, potash (or soda), and (2) semi-crystal glasses, in which part of the lead has been replaced by lime.

Class III. Colored glasses, which may contain the elements of Classes I and II and in addition one or more coloring elements, usually metallic oxides.[5]

Class IV. Scientific glasses, which may contain in addition to the components of Classes I and II, zinc, barium, phosphate or borate. This class comprises the various optical glasses and the different types of chemical glassware.

Class V. Opaque glasses, containing the elements of Class IV and in addition may include fluoride, chloride, sulphate, tin, titanium and zirconium.[6]

[1]Linton Mineral Industry, 1899. [2]Benrath. Glasfabrikation. [3]Tscheuschner, Handbuch der Glasfabrikation. [4]Thorpe, Dictionary of Applied Chemistry, Vol. 2. [5]"Colored Glasses," THE GLASS INDUSTRY, Vol. 2, p. 294.

[6]The composition of Opaque Glasses. THE GLASS INDUSTRY, Vol. 2, pp. 81-84. [7]Bulletin No. 700. U. S. Geological Survey. [8]A treatise on the Ceramic Industries, Vol. 1.

From the above classification it follows that a glass analysis may range from a simple estimation of silica, lime and sodium oxide to one of the most complicated problems in mineral chemistry which may require the separation and quantitative estimation of several of the following elements: aluminum, antimony, arsenic, barium, boron, calcium, chlorine, chromium, cobalt, copper, fluorine, gold, iron, lead, lithium, magnesium, manganese, nickel, phosphorus, potassium, selenium, silicon, silver, sodium, strontium, sulphur, tin, titanium, zinc and zirconium.

The labor of the glass chemist has been lightened considerably in recent years due to the publication of Hillebrand's admirable treatise, "The Analysis of Silicate and Carbonate Rocks,"[7] and the elaborate work of Mellor, "Quantitative Inorganic Analysis."[8] A number of publications on the subject of glass analysis have appeared from time to time in the periodical scientific press. No exhaustive treatise on this subject, covering glass analysis in every phase, has been published.

### Analysis of Common Glass

In the majority of cases it is sufficient to estimate silica, and the oxides of iron, aluminum, calcium and magnesium, and to find the amount of alkali oxide by deducting the sum of the percentages of the estimated components from 100. However, if greater accuracy is desired, or if the glass contains both alkalies, it is necessary to make a separate determination. In order to save time it is advisable to start the estimation of the alkalies and of the other constituents at the same time.

Transfer a one gram sample of finely powdered glass to a platinum crucible, containing 5 grams of calcined sodium carbonate. Mix with a glass rod, replace the cover and slowly heat to fusion. Keep the contents of the crucible at the fusion temperature for about one-half hour, then pour the liquid quickly into a platinum dish which floats in a beaker filled with water. This prevents the adherence of the mass to the crucible and on account of the rapid cooling the solid cake does not stick to the platinum dish, and can be easily transferred to a beaker where it is treated with dilute hydrochloric acid. The crucible is transferred to the same beaker, covered with hot water to which a few drops of acid are added, and washed free from any adhering matter.

### ESTIMATION OF SILICA

Transfer the contents of the beaker to a porcelain dish, evaporate to dryness on a water bath, add acid and hot water and repeat the evaporation. Add about 10 cc. of acid, 100 cc. of hot water, filter the silica on a filter paper, wash with 1% hydrochloric acid and finally with hot water.

Transfer the filter paper and precipitate to a tared platinum crucible, and carefully ignite to constant weight. If greater accuracy is desired treat the silica with a few drops of sulphuric acid and add hydrofluoric acid. Evaporate on a steam bath until the silica has volatilized completely as silicon tetrafluoride, drive off the sulphuric acid, heat in an open flame and weigh. The difference in weight is the silica.[9]

Calculation: Weight of Silica $\times$ 100 = % $SiO_2$.

### ESTIMATION OF IRON OXIDE AND ALUMINA

To the filtrate of the silica add 3 grams of ammonium chloride and 5 cc. of hydrogen peroxide. Heat to boiling and add ammonia, drop by drop until the solution is slightly alkaline. Allow the precipitate of the hydroxides of iron and aluminum to settle, filter on a small filter paper, wash with hot water, ignite in a platinum crucible and weigh.

Calculation: Weight of Iron Oxide and Aluminum $\times$ 100 = % $Fe_2O_3 + Al_2O_3$.

In case a separation of the combined oxides is desired, fuse the ignited precipitate with soda, dissolve in hot water and a few drops of hydrochloric acid, allow to cool, add two grams of potassium iodide and titrate the iodine liberated by the ferric chloride with N/20 sodium thiosulphate solution.

Calculations: cc. N/20 $Na_2S_2O_3 \times .399$ = % $Fe_2O_3$

% ($Fe_2O_3 + Al_2O_3$) — % $Fe_2O_3$ = % $Al_2O_3$

### ESTIMATION OF LIME

To the filtrate from the combined oxides add a solution of ammonium oxalate until no further precipitate is formed, heat to boiling, stir vigorously and allow the precipitate to settle. Filter, wash with hot water, ignite in a platinum crucible, first over a Bunsen flame and finally over a Meker blast lamp till constant weight is obtained.

Calculation: Weight of CaO $\times$ 100 = % CaO.

[9]When greater accuracy is required, the residue remaining in the crucible should be fused with a small amount of soda dissolved in hydrochloric acid and added to the filtrate from the silica.

### ESTIMATION OF MAGNESIA

Acidify the filtrate from the lime with hydrochloric acid, heat to boiling, add a solution of microcosmic salt and add dilute ammonia until neutrality. Stir well, until a precipitate is formed. After 15 minutes add 25 cc. of ammonia and allow the precipitate to settle for several hours. Filter, wash with 3% ammonia solution, ignite the precipitate as described in the estimation of lime, taking care that the magnesium pyrophosphate does not fuse.

Calculation: Weight of $Mg_2 P_2 O_7 \times 36.21$ = % MgO.

### ESTIMATION OF THE ALKALIES

Structural glass is made exclusively with soda ash or salt cake, but lime flint glass often contains both sodium and potassium, introduced as carbonates or one as carbonate and the other as nitrate.

Mix a one gram sample of glass with one gram of ammonium chloride, add 8 grams of calcium carbonate and mix in an agate or a glass mortar. Transfer to a platinum crucible, containing one half gram of calcium carbonate. Spread evenly over the bottom. Place the crucible in a hole, cut in a sheet of asbestos, the hole of such size that about two-thirds of the crucible is below the sheet. Heat with a very small flame until the ammonium chloride is volatilized. Increase the size of the flame until the lower part of the crucible is brought to a red heat, and keep at this temperature for about one hour. The crucible should be kept covered during the heating. The mass contracts in volume during ignition but fusion should be avoided.

Transfer the cake to a porcelain dish, add water and heat on a water bath until complete disintegration, which may be hastened by trituration with a pestle. Filter and wash with hot water. To the filtrate, which contains the alkalies as chlorides, with calcium chloride and hydroxide, add a saturated solution of ammonium carbonate, filter and concentrate the filtrate in a porcelain dish to about 30 cc., add a few drops of ammonium carbonate, allow to stand a few hours and filter into a small porcelain dish. Add 2 cc. of sulphuric acid (1:1), evaporate on a water bath, expel the ammonium sulphate and the excess of sulphuric acid by heating and add about 5 cc. of water. Filter through a small filter into a tared platinum dish, evaporate to dryness and ignite over a small flame. Weigh as combined sulphates, $K_2SO_4 + Na_2SO_4$.

### ESTIMATION OF POTASSIUM

Dissolve the sulphates in water, add a few drops of hydrochloric acid and transfer the solution to a small porcelain dish. Add a slight excess of chlorplatinic acid, containing about 0.3 gram of platinum in each 10 cc. Evaporate to a thick paste, add 85% alcohol and allow to stand a few minutes. Pour the liquid through a tared Gooch crucible, wash with alcohol, then with a strong solution of ammonium chloride, saturated with potassium platinic chloride and finally with alcohol. Dry at 130° C. and weigh as $K_2PtCl_6$.

Calculations:

Weight of $K_2PtCl_6 \times 19.38$ = % $K_2O$

$K_2O \times 1.85 = K_2SO_4$

Combined sulphates — $K_2SO_4 = Na_2SO_4$

Weight of $Na_2SO_4 \times 43.64$ = % $Na_2O$.

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CLASSIFED BUYERS' GUIDE PAGE 8


## Assistance for Scientific Investigators

The Information Service of the National Research Council, 1701 Massachusetts avenue, Washington, D. C., is prepared to assist investigators who lack library facilities by locating for them inaccessible scientific publications needed in their work.

## Trade Associations Can Now Breathe Freely

The widespread uneasiness during the past year among members of trade associations engaged in collecting, collating and distributing trade information and statistics, aroused because of Governmental activities directed against certain such associations on the ground that they were acting in restraint of trade has to a large extent been allayed by the publication of correspondence on the subject between Secretary of Commerce Hoover and Attorney-General Daugherty.

These letters, printed elsewhere in this issue, put the matter in an entirely different light to that surrounding it since the famous decision of the Supremt Court on December 19, 1921, in the case of the American Hardwood Manufacturers' Association. By this decision the highest tribunal affirmed the decision of the lower courts to the effect that competitors who exchange information pertaining to past transactions, prices and production are guilty of violating the Sherman anti-trust law.

This decision threatened to choke to death the beneficent activities of many trade associations and to seriously hamper progress in many industries. It seemed possible also that plans that had been under way for closer cooperation between the Department of Commerce and the various trade associations would be wrecked. A flood of protest and demands for a definite expression as to the Government's future policy on this question beset the heads of the department. "What may a trade association legally do, and what must it not do?"

This question has now been answered by Secretary Hoover and Attorney-General Daugherty in a fairly satisfactory way, sufficiently so to enable trade associations to proceed with their activities knowing that if they keep within the boundaries delimited in the published correspondence of these officials their feet will remain on solid ground.

Trade associations possess tremendous potential power for good or evil to the industries they represent. The glass trade is no exception to the rule and will perhaps be more vitally affected than it realizes by the policy adopted by the Department of Justice, of moderation toward trade associations.

## Technical Consultation Service

**THE GLASS INDUSTRY invites its readers to refer to this department any problems with which they may be confronted pertaining to raw materials, glass technology, laboratory and factory practice. While making no pretensions to the possession of unbounded knowledge or infallibility THE GLASS INDUSTRY is ready to assist its readers to the best of its ability in solving their problems. Readers who can offer better suggestions are invited to submit them.**

**Answers to all questions will be made by mail as promptly as possible. The source of all inquiries will be held in strict confidence.**

QUESTION 19—I have been mighty interested in your articles and just now in the Technical Consultation Service, question 18 covers a subject that has been more or less before my attention for sometime.

We have in our system a number of places where two or three tanks are fed from the same batch system. The method of mixing the batch is generally a normally good operation and there is little chance that segregation is liable to occur. There are times when the analyses of glass from two tanks thus operated together are not alike. I have made allowance for variation in the alumina content on the basis of tank blocks but variation in the silica and soda have not been so easily explained.

The tank temperatures as measured with an optical pyrometer

have generally been within 50 to 75°, the same, though of course we were not able to get the heat of the glass all over the tank. In some cases after the tank has been allowed to cool we have been able to check up the uniformity of the glass which is as you say. There is practically no difference in any part of the tank in the general composition of the glass.

Can you tell me how wide a heat variation will cause an appreciable affect in the alkali content?

ANSWER.—It has been my experience that glass, made in two tanks located a few miles apart, but operated under similar conditions, fed with batches identical in composition yielded products showing an almost constant difference in sodium oxide. This disparity has been ascribed to slight variations in temperature due to differences in construction, methods of firing, draft, etc.

It has often been surprising to note the uniformity in composition of glass made in the same tank week after week, when temperature conditions were maintained carefully. Changes in composition were observed to be more frequent during the winter months, due possibly to changes in gas pressure, which are less apt to occur in summer.

I believe that a change of 100° F. is sufficient to cause a difference in the alkali contents of glass, as much as 0.5 per cent $Na_2O$.

I cannot offer any explanation of the differences in silica which you have noticed, and have never observed them. Such differences as have occurred have always proved to be due to variations in the silica contents of the limestone used.

I greatly appreciate the opportunity to discuss this matter. Experimentation with tanks full of glass is of course, out of the question and yet it would be the only way of solving such problems. The next best procedure is to collect the opinions of those in charge of operations, and by careful comparison try to attain the truth.—J. B. K.

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QUESTION 20.—Please send back numbers containing formulae for selenium red glass.

ANSWER.—No formula for selenium red glass has been published in any of the back numbers of THE GLASS INDUSTRY. It has been felt that the publication of a glass formula involves a responsibility which a conscientious editor does not care to assume, and as a general policy no formula will be published. I am personally willing to give you a couple of batches which, however, I have not tried out in practice and for which I assume no responsibility. If you wish to try them out an experiment should be made on a small scale for which a "monkey pot" has been found satisfactory.—J. B. K.

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QUESTION 21.—Is it possible for you to advise me as to the correct temperature of producer gas, in the oven for the flattening of window glass? Should a clear fire or smoky fire be used to get best results.

ANSWER.—The temperature for the flattening of window glass is from 650 to 700 degrees C. (1200-1290 degrees F.) The best results are obtained with a smoky fire.—J. B. K.

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QUESTION 22.—In our glass factory in Brazil, due to the scarcity of coal, we are using mainly wood in our gas producers. This wood burning produces a large amount of tar. We have to clean our gas conduits every week but despite this cleaning, the gas still contains tar and ashes when burning in the furnace. Is there any means of preventing the tar and ashes from going to the burners, or is there any book treating of the purification of gas in a case like this?

ANSWER:—The use of wood fuel in gas producers is practically unknown to the glass industry of the United States and very few persons have had the experience with it which would qualify them to solve your problem from first-hand practical knowledge. Your question, however, has been submitted to several producer gas engineers, one of whom gives the following opinion:

> This is rather meagre information for us to base an opinion on, however you also state that the trouble is at the burners. It ocurs to us that possibly they are using unwashed producer gas and that it is hot enough to carry the tar as far as the burners, and then the burners being of iron and in contact with the air, the tar in the gas is cold enough by this time to condense and make trouble. If this happens to be the case, we believe they would be entirely out of their trouble, so far as the tar goes, if the burners were kept warm by surrounding them with asbestos. We have had difficulty of this kind and have had no trouble in overcoming it completely in this way. We would have to have more information before we could advise you further. Usually producer gas made from wood carries over considerable ash along with the gas, but if the gas is kept hot so that the tar does not condense, no trouble is experienced with the ash.

A well-known engineer says:

> We have had very little experience or knowledge of the operation of producers using wood as fuel. However, inasmuch as there is a great deal of soot in the wood that is used which will naturally deposit resin and other products in the gas conduits, the same trouble would be experienced which we sometimes have with coal that precipitates a large proportion of tar. This precipitation in the case of either wood or coal comes about at points where the gas is cooled below a certain temperature in the pipes or conduits leading to the furnace. Therefore, a large proportion of this could be overcome by following the practice that we are at the present time. That is, line the pipes with insulating material that will prevent the radiation of heat and maintain the gas at a high enough temperature until it reaches the point of combustion, to prevent the precipitation. If the producer is run hot enough to prevent the formation of these products in the gas lines or conduits, naturally, much of it would be consumed in the producer and the gas would be so lean and low in its B. t. u. values that it would not be at all profitable. Therefore the only recommendation that we can make is to keep the gas hot until it reaches farthest combustion. This is done by using nonpareil or silo-cel brick next to the jacket of the gas pipe, and inside a lining of fire brick. This will prevent the loss of heat by radiation and maintain a temperature of the gas that will very largely overcome the trouble you speak of.

## Books

HANDBOOK OF CHEMISTRY AND PHYSICS. A ready-reference pocket book of chemical and physical data. Eighth edition. By Charles D. Hodgman, M. S.; Melville F. Coalbaugh, M. A., and Cornelius E. Senseman, M. A. Size, 6¼x4¼ inches; 711 pages. Published by The Chemical Rubber Company. Price, $3.

This handbook is probably unique, inasmuch as it combines mathematical, chemical and physical data in one volume, which makes it especially useful to the chemical engineer. The analyst will appreciate a very comprehensive list of gravimetric factors and their logarithms, and a condensed scheme of qualitative analysis. The eighth edition includes a number of tables, incorporated for the first time in this handbook. Many other tables, although appearing in previous editions, have been rewritten and enlarged. Sixteen pages are devoted to laboratory arts and useful recipes. This book is for sale by THE GLASS INDUSTRY.

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HENDRICKS' COMMERCIAL REGISTER OF THE UNITED STATES. 30th edition for 1922. 2324 pages, 8½x11½ inches. $12.50 (in foreign countries $15). S. E. Hendricks Co., Inc. For sale by THE GLASS INDUSTRY, 19 Liberty Street, New York.

This old, well-known complete and reliable annual register of producers, manufacturers, dealers and consumers, is especially devoted to the electrical, engineering, hardware, iron and steel, mechanical, metal, mill, mining, quarrying, railroad, architectural, constructional, contracting, chemical and kindred industries in the United States.

This edition in the new standard size, 8½x11½ inches, with a type size 7x10 inches, presents a greatly improved appearance over previous editions. The text matter has been opened up leaving a space between the columns making it more readable as well as more attractive and giving ample space for checking and memoranda. The larger page taking more matter naturally requires fewer pages and gives a thinner book, which in turn makes it easier to handle. The publishers state that although the increased size of the page takes 25 per cent more matter and would normally reduce the number of pages from 2800 to 2100, enough new matter has been added to make more than 2300 pages.

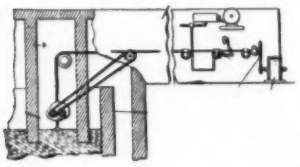
This work is extraordinarily comprehensive, is conveniently indexed and constitutes an invaluable aid to the buyer who desires to obtain the names of manufacturers in the United States of almost any required product, or to the seller who desires to circularize various trades, and who will find the information given to be much more complete and reliable than is the ordinary mailing list or industrial directory.

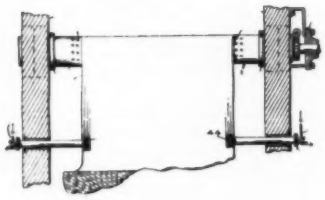
# Recent Patents

**NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT**

**Copies of the Patent Specifications mentioned below may be obtained from the Commissioner of Patents, Washington, D. C. Price 10c. each.**

**Sheet-Glass-Drawing Apparatus.** U. S. 1,399,547. December 6, 1921. Robert G. Ewing of Toledo, Ohio.





This invention relates to the manufacture of sheet glass, and more particularly to the continuous drawing thereof from a pool of molten glass and from thence to pass over a bending roll.

The inventor claims that this invention has utility when incorporated in apparatus for the manufacture of sheet glass, especially in connection with rolls used for lifting, drawing, carrying, directing, or surface finishing sheet glass, and the provision of devices for so handling the glass that the surface thereof may not be chilled nor the glass be clouded.

Sheet glass as drawn from a molten pool has a clear fire finish. To avoid chilling, clouding or dulling effects on such highly finished glass surface, even after passing rolls it is claimed is attained by this invention.

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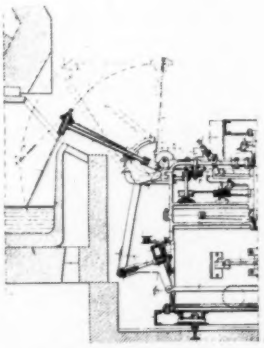
**Automatic Machine for Blowing Glass.** U. S. 1,401,713. Dec. 27, 1921. Ernest Lecoultre, of Paris, France, assignor to Compagnie Generale D'Electricite, of Paris, France.

The subject of the present invention is an entirely automatic machine which effects all the operations ordinarily executed manually by glass blowers as well as certain other supplementary operations.



The inventor claims an automatic machine for the manufacture of articles of blown glass, as shown in accompanying cut consisting of a main support, a series of radial arms, means for mounting the radial arms for a bodily revolving movement around a common axis independently of each other, means for individually pivoting the arms for vertical movement. Also a continuously operated member and an intermittently operated member for controlling the movements of the radial arms, automatic means for alternately connecting the individual arms to the continuously and intermittently operated means, and means for controlling the operated members.

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**Method of Grinding Glass.** U. S. 1,401,830. Dec. 27, 1921. William Taylor, of Leicester, England.

This invention relates to a method of grinding glass and the like. An object of the invention is to provide for rapidly forming a spherical surface upon a glass blank. The method is particularly adapted to the grinding of lenses which are to have a deep convex curve.

The inventor claims a method of grinding a convex spherically curved surface upon a flat disk of glass, which comprises rotating the disk upon an axis passing through the surface to be ground, forming in the surface to be ground a circular step having its center on the axis of rotation of the disk, grinding back the step to the axis by bringing successive portions of the side of the step into contact with a grinding surface moving along the portion of the side of the step with which it is in contact, and decreasing the depth of the step as it is ground inwardly while varying the angle of the side of the step to the original surface of the disk so that it is acute at the beginning of the operation and substantially a right angle at the end of the operation.

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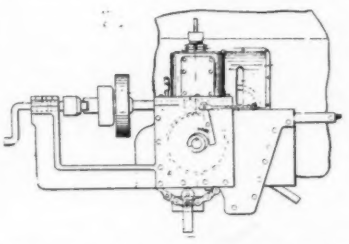
**Mechanism for Forming Glassware.** U. S. 1,400,621. Dec. 20, 1921. William J. Miller, of Swissvale, Pa.

This invention consists in a new and improved machine for pressing glassware, and means for mounting the same in connection with the tank or other container of molten glass.



The object in view is the provision of automatic mechanism of this character which will produce pressed glassware at great speed and in large quantities, thus greatly reducing the cost of manufacture and increasing the output.

The machine consists of a series of molds, pivotally mounted and flexibly connected together; means for moving said series intermittently to bring said molds in turn into the pressing position; means for shearing the glass deposited into the molds; pressing mechanism, and means for tilting the molds to discharge the pressed ware.

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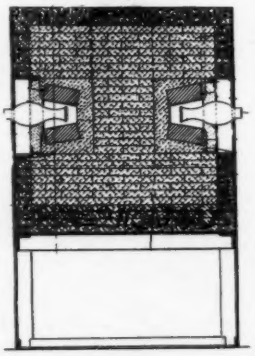
**Electric Glass-Annealing Furnace.** U. S. 1,401,674. Dec. 27, 1921. Ora A. Colby, of Irwin, Pennsylvania, assignor to Westinghouse Electric & Manufacturing Company.

This invention relates to electric furnaces and particularly to furnaces of the electric-resistance type and it has for one of its objects to provide an electric-resistance furnace for annealing glass objects which shall have a relatively low rate of deterioration of the resistor and which may be operated for comparatively long periods of time at a relatively high temperature.

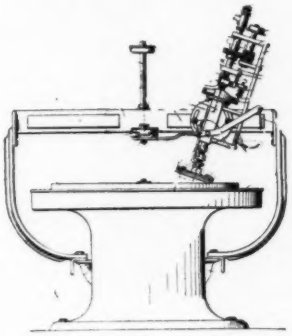


Another object is to provide a furnace of this type with a resistor comprising solid blocks of refractory electrical-conducting material which shall be so located relative to each other as to cause a higher temperature at one end of the annealing chamber than will exist at the other end thereof.

Still another object is to provide a construction for a furnace of the character indicated which shall permit of combining a number of such furnaces in a relatively small

space, thus increasing the heat efficiency of the individual furnaces and having a relatively small number of terminal electrodes to conduct the current to and from all of the resistors.

**Machine for Grinding Glass Plates.** U. S. 1,401,698. Dec. 27, 1921. Walter J. Herschede and Walter Eberhardt, of Cincinnati, Ohio.



The invention relates to an improved machine for grinding glass plates. The inventor claims for the machine a device that will automatically grind glass plates, and operate faster and more accurately than devices used heretofore. Also a device that will bevel oval pieces of glass accurately and that will not leave waves in the bevel, and also prevents grooving of the grindstone.

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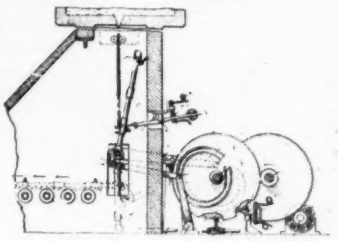
**Sheet-Glass-Drawing Mechanism.** U. S. 1,402,145. January 2, 1922. Robert P. Callard, Charleston, W. Va., assignor to the Libbey-Owens Sheet Glass Company, Toledo, Ohio.

This invention relates to a sheet glass drawing machine consisting of a carrier, means for delivering sections of sheet glass to the carrier, and suction devices holding the sections on the carrier.



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**Glass Cutter.** U. S. 1,402,961. Jan. 10, 1922. Walter W. Ratcliff, of Glidden, Iowa.

The object of this invention is to provide an improved construction for a rotary glass cutter.

A further object of this invention is to provide improved means for cutting glass in circular form of any desired radius and applying even pressure throughout the operation upon the glass, at a single point only.

Another object of this invention is to provide improved means for throwing the cutting mechanism up into inoperative position.

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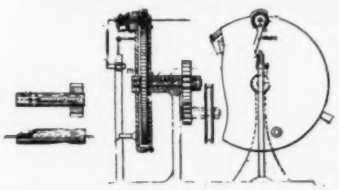
**Machine for Making Glass Beads.** U. S. 1,391,527. Sept. 20, 1921. William F. Chase, of Peekskill, N. Y.

This invention relates to the making of glass beads, and its object is to provide a machine for the purpose that shall make a more perfect production, with a saving of time and labor. As shown in the accompanying illustration the machine comprises a shaft bearing supported on a standard with a base, a hollow shaft in the bearing and a solid shaft to run in the hollow shaft. Also means to drive the hollow shaft, a spur gear wheel on the outer end of the hollow shaft, a disk frame on the solid shaft adjacent to the spur gear wheel, a hollow spindle in the frame and a gear pinion on the spindle engaging with the spur wheel, a handle on the frame, cutting off means attached to the frame adjacent to the spindle comprising a die and cutting off lever, a post adjacent to the frame, fast to the base, for tripping the cutting off lever, a stop on the frame to contact with the post, and an adjustable gage in the top of the post.



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**Glass-Cutting Machine.** U. S. 1,402,457. Jan. 3, 1922. John A. Milliken, of Bayonne, New Jersey, assignor to John E. Marsden, of Atlantic City, New Jersey.

This invention is a machine for cutting or grinding ornamental designs into the surfaces of glass articles, such as tumblers and the like.

The inventor claims for this machine an improvement in glass cutting mechanism comprising a chuck, a grinder, means for moving the grinder into and out of engagement with an article carried by the chuck, a feeler slide for contacting with an article carried by the chuck, whereby the slide may be variably positioned in accordance with the size of the article, means whereby movement of the grinder toward the chuck is limited by the slide, and means for limiting movement of the feeler slide away from the chuck.

## Patent Infringement Decision

In the case of the American Window Glass Machine Company and the American Window Glass Company against the New Bethlehem Window Glass Company in the United States District Court at Pittsburgh, Pa., Judge Thompson on February 14, 1922, found that 12 patents held by the plaintiffs had been infringed by the defendant as follows:

"Patent No. 702,013, claims 1, 12 and 7.
"Patent No. 702,014, claims 1, 5, 8 and 9.
"Patent No. 702,013, claims 1, 2, 5 and 6.
"Patent No. 762,880, claim 1.
"Patent No. 821,361, claims 1, 2 and 3.
"Patent No. 822,678, claims 1 to 8, both inclusive.
"Patent No. 834,750, claims 1 and 2.
"Patent No. 886,818, claims 1 and 20 to 25, inclusive.
"Patent No. 914,588, claims 5, 6 and 7.
"Patent No. 977,885, claims 6, 7 and 9.
"Patent No. 1,006,995, claims 1, 2 and 4.
"Patent No. 1,020,920, claims 6, 7 and 8."

Claims that certain other patents had been violated were dismissed.

## Owens Bottle Company Begins Suits

The Owens Bottle Company and the Toledo Glass Company of Toledo, O., and the Hazel-Atlas Glass Company of Wheeling, W. Va., on February 16th filed an infringement suit in the United States Court at Toledo, O., against The O'Neill Machine Company, of Toledo, and have announced that similar suits were filed in the Federal Court at Indianapolis, Ind., against the Hart Glass Company of Dunkirk, Ind.

Notices of infringement have also been sent out by the Owens' interests to approximately thirty-five manufacturers of bottles in various parts of the country and considerable further litigation is anticipated.

The suits are based on five United States patents owned by the Owens company as follows: No. 836,297, November 20, 1906 and No. 883,779, April 7, 1908, issued to Henry M. Brookfield of New York City; No. 919,120, April 20, 1909, issued to William Emil Bock of Toledo, Ohio, and No. 1,382,993 and No. 1,382,994, June 28, 1921, issued to Clyde R. Lott of Washington, D. C.

The Owens company asserts that these patents control the feeder method of making bottles automatically, which has lately become of considerable importance. It is an entirely separate and distinct process from the vacuum method carried on by the Owens machine.

The Owens company claims that the method developed in recent years with considerable success by the O'Neill Machine Company, involving a semi-automatic machine for making glass bottles to which there has lately been added a feeding method, involves an infringement of the Owens' patent.

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**Patent Office Relief Bill Passed.**—The so-called Patent Office relief bill providing for the reorganization of the Patent Office and making possible numerous reforms in the conduct of the department has passed the Senate. Funds for the necessarily increasing activities are to be provided by raising the filing fee for application to five dollars. The bill had already passed the House.

# Glass Factory Equipment and Supplies

**THE GLASS INDUSTRY will be glad to publish descriptions of new and useful devices, machinery and supplies of interest to the glass manufacturing trade. Most of the information printed in this department comes direct from the manufacturers of the products described.**

## The Dixon Strain Finder

BY E. E. MILNER*

Proper annealing requires—first, a careful regulation of temperature in the lehr; second, constant attention by skilled men to see that these temperatures are maintained; third, the means to determine whether the proper annealing is being obtained. The first has been made possible by the accurate temperature control of the Dixon muffle lehr. The second is not difficult, due to the large number of skilled men released by the introduction of automatic machinery, and the third is made easy by the use of the Dixon Strain Finder.

Substantial in construction, it may be used in the factory and need not be confined to the chemists' laboratory or special dark room as many other instruments are. The frame work (A) Fig. 1 is of polished mahogany, upon which is mounted a non-breakable metal reflector (B) with a highly polished surface. The metal lantern (C) of parabolic shape, fitted with 200 watt lamp and opal diffusion lens (D) throws a concentrated beam upon the entire surface of reflector, giving a wide range of vision, large enough to take in the average size piece to be examined.

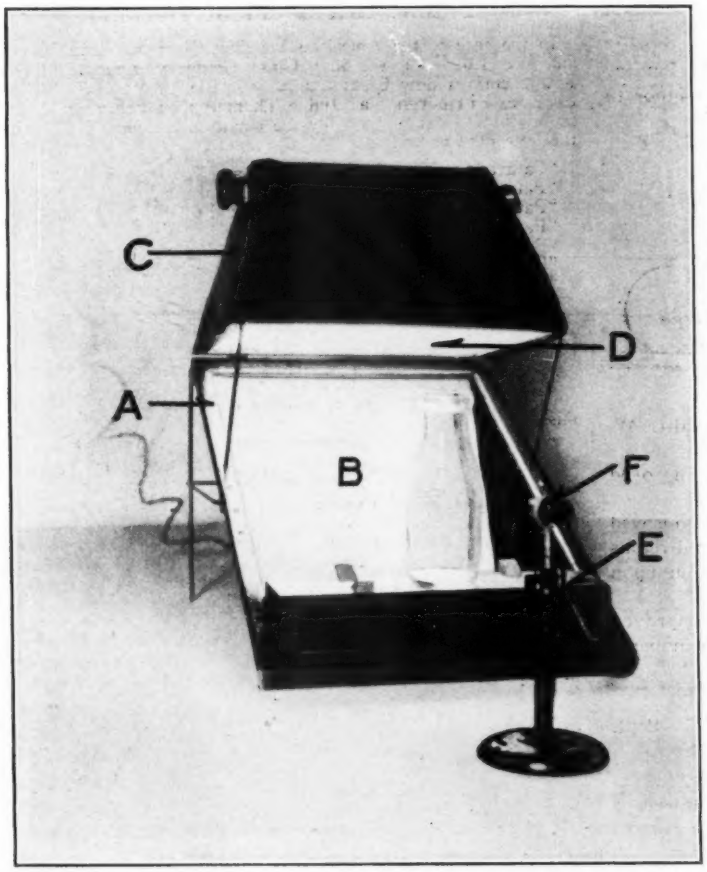


FIG. 1—INSTRUMENT SET UP IN POSITION FOR USE

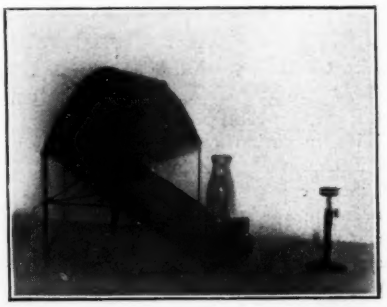

FIG. 2—SIDE VIEW OF INSTRUMENT

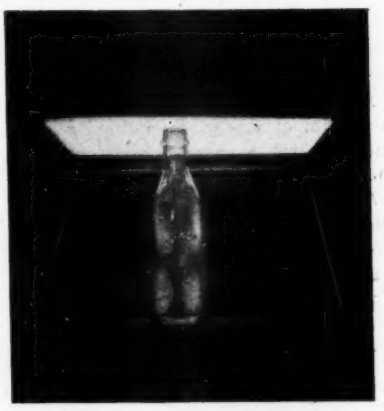

FIG. 3—PHOTOGRAPH THROUGH STRAIN FINDER SHOWING STRAINS IN BOTTLE—INDICATED BY WHITE SPOTS WHERE STRAINS OCCUR.

Primarily designed for the Dixon company's own use in the development of annealing lehrs, the company has now placed the Dixon Strain Finder on the market for those manufacturers who see the necessity of properly annealing their product. While a few instruments for this purpose are already on the market, differing only in design or material arrangement, the Dixon Strain Finder combines a medium priced instrument with the refinement of the optical manufacturers' system of observing the refraction of polarized light.

An adjustable shelf (E) of polished mahogany, upon which the piece is placed, automatically locates it in a position for full observation at the proper angle and distance from the observer. The Nicol prism (F) mounted in brass is supported in the adjustable holder at a convenient height. It is made of the very best imported Iceland spar, carefully ground and polished in the John A. Brashear laboratory, specially for this instrument. This instrument is practically the same as those used by large instrument makers, differing but slightly from the instruments used by the Ordnance Department in testing optical glass.

Shown in figures 3 and 4 are photographs taken through the

*H. L. Dixon Company.

prism, showing exactly what is seen when observing glassware under strain or pressure. It does not require a trained eye for detecting the strain, but on the contrary when used a few times

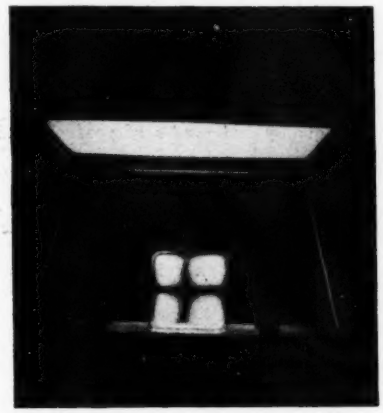

FIG. 4—PHOTOGRAPH THROUGH STRAIN FINDER WHICH SHOWS UNIFORM STRAIN THROUGHOUT A VAULT LIGHT, INDICATED BY WHITE SPOTS AND BLACK CROSS.

permits the observer to determine the allowable or permissible degree of strain for his own particular product and gives him a close check on the operation of annealing lehrs or ovens. The use of this instrument is not confined to clear crystal glass; it may be used for observing strain in transparent amber, green and

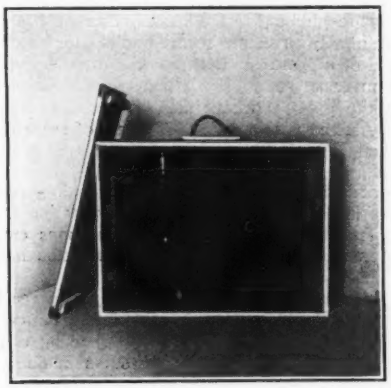

FIG 5—STRAIN FINDER PACKED FOR SHIPMENT

other colors. The addition of proper color screens will increase the contrast, but they are not necessary.

The instrument may be folded into a small package, Fig. 5, and can be carried from place to place and set up for use in a few moments. It is shipped ready to set up for instant use.

# Legal Scope of Trade Associations Defined

## Correspondence Between Secretary Hoover and Attorney-General Daugherty Clears the Atmosphere

The situation regarding the activities of legitimate trade associations having become most disturbing and the questions arising therefrom being of extremely complex legal character it was decided, after long consideration and many consultations, that instead of issuing a formal statement as had been expected, the whole correspondence between the Department of Commerce and the Department of Justice would be released.

The series of letters begins with one dated February 3, 1922, from Secretary Hoover to Attorney-General Daugherty. After calling attention to the organic act creating the Department of Commerce and imposing upon it the duty of fostering, promoting and developing domestic and foreign commerce and industry and of employing all available legal means of co-operating with industry in order to accomplish the desired result the Secretary points out the necessity to the individual engaged in industry of obtaining not only scientific information regarding his products but also as much other information as possible bearing upon the commercial features of his enterprise. Production and distribution are both affected by economic conditions, hence the necessity for organized methods of obtaining continuously reliable information regarding trade conditions and the establishment of trade associations to carry on this work.

Secretary Hoover continues as follows:

Trade associations have been in existence for many years. The great majority are legitimate, both in form of organization and in activity. The minority, while lawfully organized under articles expressing lawful purposes, may engage in activities that are evidence of purpose contrary to and outside of the declared purposes in the articles of organization.

Again, a trade association may have lawful form of organization and the activities of its officers may be clearly within the purposes declared in the association charter, and yet members of the organization may, by unlawful confederation, use the information lawfully secured for unlawful purposes. It may, therefore, truthfully be said that the line dividing the good association and the bad, the proper activity from the improper one, and the lawful activities of the officers of an association from the unlawful acts of the membership, can not be determined, in every instance, with singular ease. It is my belief, however, that it is more easy to determine the forms of organizations and activities that are generally recognized as good than to determine in advance those that may be bad, because, in the latter instance, the peculiar facts relating to each association the subject of inquiry may determine whether the organization or its members are operating in violation of law.

It is with much earnestness that I claim there is propriety, generally speaking, in trade associations. Their lawful field of endeavor is large, and their activities work for promotion and advancement of the public welfare and for progressive economic organization. In making this statement, I am not unmindful of the fact that the impression exists with a small minority that individual prohibited acts may be accomplished by organization under the disguise of a trade association. However, to make my position clear regarding the trade associations the existence of which I advocate, I desire to say that I have always taken the view that no body of men could combine in the form of a trade organization and do any act or thing forbidden by law if they were undertaken by them outside of a trade organization. The character of trade organization, the existence of which should be preserved is one that carries lawful purposes only in its articles of association; its activities must be in harmony with its declared purposes. The articles of association, with their lawful, declared purposes, must not be used as a mask to hide unlawful purposes. In other words, the organization can not be used to conceal or disguise any contract, combination, conspiracy, agreement, or understanding, secret or otherwise, on the part of the officers of the organization or on the part of the membership or any part thereof to engage in activities in restraint of trade or otherwise in violation of the anti-trust laws.

There has been much information collected by legitimate trade associations in which the general public has no interest whatsoever, yet information of this class has always been freely offered to the daily and the trade press, as well as to any governmental agency that might desire the information as a matter of statistical record. On the other hand, certain statistical data are collected by trade organizations that would be of vast value to the public generally if published in practical, available form.

Many of the trade associations securing and disseminating the statistical data mentioned have restricted the same to its

membership, while others have undertaken to give the same to the public through the daily and the trade press concurrently with its members. The trade associations of the latter class are in the minority.

Information lawfully secured regarding trade and economic conditions made public for the information of everyone can not be harmful. Information secured solely for the benefit of members and of a character that puts the membership, by reason of the information, in a position of advantage as compared with the public without such information can not be sanctioned by sound public policy. The act of securing the information and the use of it by the members of a particular organization may be perfectly lawful in itself, but it is my belief that good morals and a sense of fair dealing require the giving of the information secured in this collective manner to the public generally, to the end that all persons engaged in commercial transactions involving the information in question will be on an even footing.

The activities of trade associations that have received the greatest criticism involve the collection of statistics relating to volume of production, capacity to produce by districts of production, wages, consumption of products in domestic and foreign trade, distribution thereof including volume of distribution by districts, together with figures as to stocks on hand, wholesale and retail, by districts, coupled with information as to price, either in the form of individual reports of each member distributed to every other member or the individual prices reported to the association and by the latter compiled and averaged by districts for certain specified periods.

If information regarding production, capacity, and distribution by districts, with average prices for grades, brands, sizes, styles, or qualities sold in the respective districts for specified periods of time could be given to the public at the same time that such information is available to the members of an association, in my judgment, great public good would result. With this information available, everyone dealing in the products of a given industry, whether buyer or seller, would have the same information regarding conditions and, in dealing with one another, would have knowledge of the same facts upon which to form their judgments as to the proper course to pursue.

A majority of the association collecting data of the nature indicated have distributed same only to members of the association, while others have undertaken to give the information to the public through the daily and trade papers. Publications of the information by these associations in the daily press has not been general, and its availability to the public has been largely through the medium of trade papers and through the daily press to the extent that the latter may have been utilized. When published through trade papers this information should be released to members only after such publication.

It should be borne in mind that the criticism aimed at this form of activity has not involved the instrumentality for securing it or the subject matter of the information, but has been directed to the use or possible use that might be made of the information and the fact that no means existed for distributing the information to the public at the same time that it was received by the members of the association. These observations likewise apply to the criticisms directed to the furnishing of average price of given commodities according to grade, size, brand, or quality by districts for specified periods of time, based on past and closed transactions.

With these observations, which have been extended at greater length than I intended, I desire the informal expression of your views as to the following activities on the part of trade associations and their members wherein neither the form of the association nor the activity, which appear perfectly fair and lawful on the surface, is used to hide or conceal some contract, combination, conspiracy, agreement, or understanding, secret or otherwise, on the part of the association, the membership, or any part thereof to actually restrain trade or otherwise violate the Sherman Act:

### Secretary Hoover's Questions

(1) May a trade association provide for its members a standard or uniform system of cost accounting and recommend its use, provided that the costs so arrived at by the uniform method are not furnished by the members to each other or by the members to the association and by the latter to the individual members?

(2) May a trade association advocate and provide for uniformity in the use of trade phrases and trade names by its respective members for the purpose of ending confusion in trade expressions and for harmony of construction as to the meaning of trade phrases, names, and terms?

(3) May a trade association, in co-operation with its members, advocate and provide for the standardization of quality and grades of product to such members, to the end that the buying public may know what it is to receive when a particular grade or quality is specified; and may such an association, after standardizing quality and grade, provide standard form of contract for the purpose of correctly designating the standards of quality and grades of product; and may it standardize technical and scientific terms, its processes in production, and its machinery; and may the association co-operate with its members in determining means for the elimination of wasteful processes in production and distribution and for the raising of ethical standards in trade for the prevention of dishonest practices?

(4) May a trade association collect credit information as to the financial responsibility, business reputation, and standing of those using the products of the industry; and may the association furnish such information to individual members upon request therefor, provided such information is not used by the association or the members for the purpose of unlawfully establishing so-called "blacklists."

(5) May a trade association arrange for the handling of the insurance of its members, including fire, industrial, indemnity, or group insurance. In other words, can the members of an industry, through the agency of a trade association, arrange for or place all of the insurance of the members?

(6) May a trade association, in co-operation with its members, engage in co-operative advertising for the promotion of trade of the members of that association engaged in the particular industry; and may the association engage in such form of promotion by furnishing trade labels, designs, and trade-marks for the use of its individual members?

(7) May a trade association, for and in behalf of its members, engage in the promotion of welfare work in the plants or organizations of its members, which welfare work includes sick benefits and unemployment insurance for employees, uniform arrangements for apprenticeship in trade education, the prevention of accidents and the establishment of an employment department or bureau for co-operation with employees?

(8) May a trade association, in co-operation with its members and acting for and in behalf of its members, handle all legislative questions that may affect the particular industry, regarding factories, trades, tariff, taxes, transportation, employers' liability and workmen's compensation, as well as the handling of rate litigation and railroad transportation questions?

(9) May a trade association, in co-operation with its members and acting for and in their behalf undertake the promotion of closer relations between the particular industry and the federal and the state departments of government which may have administration of laws affecting the particular industry in any form?

(10)—A. May a trade association collect statistics from each member showing his volume of production, his capacity to produce, the wages paid, the consumption of his product in domestic or foreign trade, and his distribution thereof, specifying the volume of distribution by districts, together with his stock, wholesale or retail?

B. And may such trade association, on receipt of the individual reports of each member, compile the information in each report into a consolidated statement which shows the total volume of production of the membership, its capacity to produce by districts of production, which, in some instances, include a state or less area, the wages by districts of production, the consumption in foreign or domestic trade by districts, the volume of distribution by districts, and the stocks on hand, wholesale and retail, by districts?

C. And if, after compiling the information as aforesaid, the information received from the members as well as the combined information is not given by the association to any other person, may it then file the combined statement with the Secretary of Commerce for distribution by him to the members of the association through the public press or otherwise and to the public generally and to all persons who may be in any way interested in the product of the industry, it being understood that the individual reports for the members should cover either weekly, monthly, quarterly, or longer periods as may be deemed desirable by the members, and, when a period is adopted, the report for each member shall cover that period, and the combined report shall be for that period?

(11)—A. May a trade association, at the time it collects the production and distribution statistics above outlined, at the same time have their members report the prices they have received for the products they have sold during the period taken, specifying the volume of each grade, brand, size, style, or quality, as the case may be, and the price received for the volume so sold in each of the respective districts where the product is sold?

B. And may the association, without making known to any person the individual price reports of any member, consolidate all of the reports into one, and show the average price received for the total volume of each grade, brand, size, style, or quality, as the case may be, distributed in each district covered by the distribution statistics for the period covered by each individual report?

C. And may the association, after making such compilation, send the compiled report as to average price, as aforesaid, to the Secretary of Commerce, to be by him distributed to the public and to any or all persons who may be interested in the particular industry making the reports?

In order to avoid repeating this question in connection with each one of the activities outlined in the eleven preceding questions, may trade associations engage in any or all of the activities named without violating the law, provided the organization and the activity engaged in are not for the purpose of hiding or concealing some agreement, contract, etc., to actually restrain trade or otherwise violate the anti-trust laws?

As stated in the beginning, I do not ask you to express your views in a formal opinion, but it is my hope that you may see your way clear to give me the advice that will enable me to adopt the proper administrative action in undertaking the duties imposed upon the Secretary of Commerce by the organic act creating the department. It is unnecessary for me to say that the general, unsettled condition regarding the proper provinces of trade associations justifies as early a reply to these inquiries as your other numerous official duties will permit.

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This letter of Secretary Hoover's was followed by Attorney General Daugherty's reply which elicited a response dated February 9, 1922, from Secretary Hoover and a final letter from the Attorney General on the same date.

OFFICE OF THE ATTORNEY GENERAL
WASHINGTON, D. C.

February 8, 1922.

My dear Mr. Secretary:

Your communication of the 3rd instant relating to the practices in which trade associations may lawfully engage was received. I recognize the force of your able discussion of the subject, and after careful consideration of the several activities which you suggest can be exercised lawfully, I beg to say:

With reference to the first paragraph, there is no apparent objection to a standard system of cost accounting, but I think associations should be warned to guard against uniform cost as to any item of expense. For illustration, a strong effort has been made by some lumber associations to take as a basic for estimating costs of production a uniform charge for stumpage Of course the cost of the timber in the tree to the different manufacturers who own their timber in the woods greatly varies; and as to each it should be charged at its actual cost. It is as clearly a violation of the law to agree upon the cost of an item that constitutes a substantial part of the total cost price when its cost actually varies, as to agree upon the sales price, because the sales price is substantially affected by such agreement. It has been ascertained that the members of one association go so far as to fix a uniform cost price, leaving to each member to determine what per cent profit he will add, thus eliminating entirely competition insofar as affected by the cost of production.

Furthermore, I have serious doubts about the advisability of the latter part of the sixth paragraph. I can see no objection to co-operative advertising designed to extend the markets of the particular article produced or handled by the members of an association, but when the several producers or dealers use uniform trade labels, designs and trademarks it seems to me the inevitable result would be a uniformity of price. Where two competing articles are advertised in precisely the same way and bear exactly the same label or trade-mark, it certainly would be difficult for one to be sold at a higher price than the other, although its quality may be superior. In a way this is illustrated in the cement industry. There a standard of quality has been adopted. That is, it is necessary for all cement to comply with a certain standard, but in practice no manufacturer undertakes to make, or at least no one advertises that he does make, a grade of cement superior to that standard. The result is that there is no competition in the sale of cement so far as quality is concerned. It seems to me therefore that it would be well to eliminate the latter clause in paragraph six, to wit, "and may the association engage in such form of promotion by furnishing trade labels, designs and trade-marks for the use of its individual members?"

I can now see nothing illegal in the exercise of the other activities mentioned, *provided always* that whatever is done is not used as a scheme or device to curtail production or enhance prices, and does not have the effect of suppressing competition. It is impossible to determine in advance just what the effect of a plan when put into actual operation may be. This is especially true with reference to trade associations, whose members are vitally interested in advancing or, as they term it, stabilizing prices, and who through the medium of the associations are brought into personal contact with each other. Therefore the expression of the view that the things enumerated by you, with the exceptions stated, may be done lawfully is only tentative; and if in the actual practice of any of them it shall develop that competition is suppressed or prices are materially enhanced, this department must treat such a practice as it treats any other one which is violative of the Anti-Trust Act.

Yours sincerely,

H. M. DAUGHERTY,
Attorney General.

Hon. HERBERT HOOVER,
Secretary of Commerce,
Washington, D. C.

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DEPARTMENT OF COMMERCE
OFFICE OF THE SECRETARY
Washington

February 9, 1922.

My dear Mr. Attorney General:

I have your letter of the eighth instant, in reply to my letter to you of February 3, 1922, in which I made informal inquiry as to the legality of certain activities of trade associations enumerated in eleven questions. It is very pleasing to me to note that our views regarding these matters are in such close harmony.

Your observations regarding the last clause in question (6) in my letter are wholly sound, based on the language of that clause. It was not, however, my idea that each constituent member of a trade association would use a community trade-mark on his product, i. e., the same trade-mark that was used by every other member of the association, and, therefore, the last clause in that question was unhappily worded. The question really relates to trade promotion through co-operative advertising, in which certain trade slogans are used, such as, "Made in Grand Rapids," which was adopted by the furniture manufacturers at that furniture center. Generally, activities covered in question (6) are conducted by a trade association in a given local community. An organization at Chicago advertises for its entire membership, which includes every line of commercial endeavor in Chicago, that the city is the great central market. It is co-operative advertising of this class that tends to promote trade extension in given lines or collected lines of industry. Certain of the trade associations, however, do devise trade-marks, not for use by all members, but for individual members. It is a well-known fact that when some manufacturer or producer is fortunate enough to select a trade-mark that appeals to the public, it becomes a great aid in selling his commodity and, as a result, it is well advertised until it becomes a household word. Other producers or manufacturers of the same kind of an article, in order to take advantage of this situation, will devise a trade-name or trade-mark as near to that of the successful competitor as he thinks he can go and still escape suit under the trade-mark or unfair competition laws. The activities of a trade association regarding trade-marks to which I referred in my letter of the third relate to the straightening out of instances of unfair competition or infringement as between the members by undertaking to design trade-marks for the individual members of the association making the same product that would absolutely prevent confusion on the part of the public as to the producer or manufacturer of the given article and, at the same time, remove all claim of infringement or unfair competition. In other words, the trade-mark activity referred

to was that of making the trade-marks of each individual member distinctive instead of common. You may, therefore, consider the part of my question (6) referred to in your letter as eliminated from the question, and that the question was really intended to cover the matters stated herein. With this explanation, I feel sure you will agree with me that our views on the matters presented are in complete accord.

Yours faithfully,

Honorable HARRY M. DAUGHERTY, Attorney General, Department of Justice,

HERBERT HOOVER, Secretary of Commerce.

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OFFICE OF THE ATTORNEY GENERAL
WASHINGTON, D. C., February 9, 1922.

My dear Mr. Secretary:

Your letter of the 9th instant relating to Paragraph (6) of the questions you had previously propounded with reference to the activities of trade associations was duly received, and in reply thereto I will say:

Not being familiar with the practices of such associations in respect to trade-names, trade-marks, labels, etc., I did not clearly understand the meaning of the latter clause of Paragraph (6), and your explanation places the matter in a somewhat different light. However, I hardly feel that I can express assent to the adoption of a rule by a trade association or to its membership engaging in a practice whereby the difference between trade-names, trade-marks, labels, etc., used by the different members of an association and questions of unfair practices arising out of such use may be determined by the association or a body constituted by it, and a resort to the courts by those believing themselves aggrieved, for the determination of such questions of unfair practices, be prevented. It seems to me that if it were recognized that associations could exercise such a power a door would be opened for the adoption of many schemes the use of which might result in the regulation of prices and the suppression of competition. The principles adopted by the courts with reference to such practices are well defined and the courts are open at all times for the redress of such injuries, while an association has no fixed principle for its guidance, and it would be inclined to take such action as would best conserve the interests of the several members.

However, I can see no objection whatever to co-operative advertising by community trade-marks or trade-names as illustrated in your communication.

Yours, very sincerely,

Hon. HERBERT HOOVER, Secretary of Commerce, Washington, D. C.

H. M. DAUGHERTY, Attorney General.

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## Ball Brothers' Great Gifts to Good Works

Announcement was made at Muncie, Ind., on February 11th, that the large contributions made from time to time to charitable, philanthropic and educational institutions by the Ball brothers, prominent glass manufacturers of that city, have been followed by another gift of a million dollars to various public welfare organizations in which the donors are interested.

The money is to be expended as follows:

To the Eastern Division of the Indiana State Normal school, situated in Muncie, $250,000 for additional buildings.

For a public auditorium in Muncie large enough to accommodate great conventions and other gatherings, $150,000.

To the Muncie Young Men's Christian Association as a permanent endowment, $100,000.

To Hillsdale College, Hillsdale, Mich., as an endowment, $100,000.

To the James Whitcomb Riley Hospital for Children, at Indianapolis $25,000.

To the Delaware County Tuberculosis Association as an Endowment for the care and treatment of those afflicted with tuberculosis and for the prevention of the disease, $25,000.

To the building fund of the Masonic temple here (announcement of which, however, was made to the Masons several months ago) $110,000.

For hospital extension work in Muncie, the character of which is to be determined later, $100,000.

The remainder of the $1,000,000 amounting to $140,000, is to be spent in ways which Ball Brothers are not yet ready to announce.

The donors are Frank C. Ball, Edmund B. Ball, George A. Ball, Dr. Lucias L. Ball and the estate of William C. Ball. The last named one of the brothers died about a year ago and it was the wish of his family that his share of the donation be included with the others.

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## Death of Major A. H. Heisey

Deep regret was felt throughout the industry when it became known that on Monday evening, February 13th, one of the best known glass manufacturers, Maj. A. H. Heisey, head of A. H. Heisey & Company, Newark, Ohio, had passed away at Atlantic City, where he and Mrs. Heisey had been spending the Winter.

Maj. Heisey was 79 years of age at the time of his death, having been born at Merrittstown, Pa., on August 3, 1843. He was educated at the local Academy where he was a schoolmate of the late Senator Philander C. Knox and the late John A. Brasheau the eminent scientist. He entered the glass industry shortly after leaving school, with the King Glass Company, Pittsburgh, Pa., and when the civil war broke out he enlisted as a private and served with distinction throughout its course, participating in thirty-two engagements, including the battle of Gettysburg, where he was slightly wounded. In addition to receiving advancement, earned all the way up from the rank of private, he was cited for gallantry in action. At the close of the war he returned to the King Glass Company. Later he became identified with the Ripley Glass Company also of Pittsburgh. In 1873 he, with his brother-in-law, Jas. E. Duncan, reorganized the Geo. Duncan & Sons Glass Company, of Pittsburgh, which became one of the successful companies of that period. He remained as one of the owners of this company until 1889, at which time they sold out to the U. S. Glass Company of Pittsburgh.For several years he remained as general manager of this last named company.

Upon severing his connection with this concern for a number of years he engaged in the mining business in Mexico and Arizona.

In 1895 Major Heisey became a resident of Newark, founding the A. H. Heisey & Company, manufacturers of glassware.

For the past 30 years he has been president of the Pittsburgh Clay Pot Company. He was founder and a director of the Newark Heat & Light Company and connected with it during its existence. He was a director of the Newark Consumers Gas Company, and he was also actively interested in the American Tribune Publishing Company. He was one of the founders, and for the past 40 years, a director of the Manufacturers Bank of Pittsburgh. He was formerly a director of the Franklin National Bank of this city, and also for a period of years president of the Newark Trust Company. In addition to these financial connections he was at the time of his death vice-president of the Ohio National Life Insurance Company of Cincinnati.

Major Heisey was an active member of many societies, clubs and charitable, political, industrial and social organizations.

Major Heisey was married May 15, 1871, at Pittsburgh, to Miss Susan N. Duncan of that city, who survives him as do the following sons and daughters: George Duncan Heisey of Newark, E. Wilson Heisey of Newark, Mrs. O. K. Dockery, Jr., of Seattle, Wash., Mrs. Fred. H. King of Cleveland, O., and T. Clarence Heisey of Newark. Six grandchildren also survive.

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HARRY CAMP, member of the Camp Glass Company, Huntington, W. Va., died on January 24th. Mr. Camp was 39 years of age and was born in New Castle, Pa., where he lived for many years, going to Huntington when the Camp Company was founded.

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JAMES A. CHAMBERS, well-known glass manufacturer, died on February 26, at Philadelphia, Pa. Mr. Chambers was founder of the Chambers & McKee Glass Company, Jeannette, Pa., and of the Chambers Glass Company, Arnold, Pa.

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**Indictment of Glass Men Dismissed.**—The action of the United States against the Johnston Brokerage Company and 103 other defendants, charging violation of the Sherman anti-trust law, was dismissed on February 8, by Judge John Knox of the United States District Court at New York, on the ground that the offense charged had not been alleged properly in the indictment as having been committed in the judicial district of New York.

The demurrer was filed by John W. Davis, former Ambassador to Great Britain, counsel for the defendants. David L. Podell, Special Assistant to the United States Attorney, in charge of the prosecution, said the Government would proceed with the case. The decision does not bar additional action, and a superseding indictment will be asked, it was indicated.

# News of the Trade

**THE GLASS INDUSTRY will be glad to receive notices of new glass manufacturing projects, plant extensions, removals, personal items, etc.**

MARSHALL W. GLEASON, president of the Gleason-Tiebout Glass Company, Brooklyn, N. Y., who recently sailed for a tour of Europe to last several months, is now in Egypt.

THE GOODCHILD GLASS MANUFACTURING COMPANY, Hawthorne, N. J., has been incorporated by Walter Goodchild, Walter Hohenhausen and Harry Grundy to manufacture glassware products.

THE WESTERN ART GLASS COMPANY, 331 North Market street, Wichita, Kans., is contemplating the erection of a three-story building, 75 by 140 feet, to cost about $60,000.

The name of R. Wood Glass Company, Durban, South Africa, has been changed to the ROBERT WOOD GLASS COMPANY, LTD. The company manufactures bottles and glassware of various kinds.

The stockholders of the BANNER WINDOW GLASS COMPANY, South Charleston, W. Va., at a meeting on January 28, decided to liquidate the assets of the company and to surrender its charter.

A charter for the FAIRFIELD SHEET GLASS COMPANY, with a capital of $800,000 was filed at Wilmington, Del., on February 15, by the Corporation Trust Company of America. The company will manufacture sheet glass.

JOHNSTON PAINT AND GLASS COMPANY, 8727 Grand River Avenue, Detroit, Mich., has been incorporated with a capital stock of $25,000 to manufacture paints, oils, etc. The incorporators: R. F. Johnson, William C., and John L. Shepard.

At the recent annual meeting of the POTOMAC GLASS COMPANY, Cumberland, Md., the following directors were elected: H. M. Sloan, Dixon C. Sloan, and Alexander Wiegand. The old officers were elected for the ensuing year.

THE KEYSTONE GLASS WORK, Inglewood, Cal., has been organized with Alex. J. McDonald, general manager, and John McDonald, secretary-treasurer. They will manufacture flint glass bottles and jars, and colored glass specialties.

Contract for the construction of a new plant, consisting of several one-story buildings, has been awarded by the CUMBERLAND GLASS MANUFACTURING COMPANY, manufacturers of glass bottles, jars, etc., Bridgeton, N. J. It is estimated that the new plant with machinery will cost $1,000,000.

The Lynch Glass Machinery Company, Anderson, Ind., announce that their new machine model "B" for small ware ranging in size from ½ oz. to 4 oz. has had a final test in their shop and shows a speed of thirty or more bottles per minute with ease. Further tests will be made soon.

THE BALL BROTHERS MANUFACTURING COMPANY, manufacturers of glass jars, etc., is erecting a new two-story brick and concrete fire-proof addition, 90 by 300 feet to its plant at Muncie, Ind. The new building will cost about $100,000, and will be used for general manufacturing and storage purposes.

Fire destroyed the SCOTT WARMAN GLASS COMPANY plant at East Stroudsburg, Pa., recently, with an estimated loss of $200,000. The company announces that it will build a strictly fireproof plant to replace the old factory and that it expects to be making bottles again by the last of April.

THE AMERICAN GLASS & BEVELING COMPANY, Cincinnati, Ohio, has been reorganized and its capital increased from $10,000 to $150,000. The following officers of the newly organized company were recently elected: president, J. F. Springard; vice-president and treasurer, J. H. Reis; H. A. Springard, vice-president and H. J. Reis, secretary.

THE HINDE & DAUCH COMPANY, specialists in the manufacture of fibre containers for glassware, Sandusky, Ohio, announces the following changes in their executive personnel: Sidney Frohman, chairman of the board; Frederick Emmons, president; J. W. Harbrecht, vice president; O. F. Rinderle, treasurer; C. N. Kiefer, secretary; W. F. Pfeiffer, assistant secretary and R. K. Ramsey, general counsel.

The Silex Company of Massachusetts has taken over the brick building at 926 Eastern avenue, Malden, Mass., and will manufacture glass coffee filters. The new concern is owned by four sisters, Miss Hazel M. Bridges, 25 Holmes street, Malden, being treasurer of the corporation and its active manager. The others are the Misses Alberta H., Minnie H. P., and Beatrice N. Bridges. At present the glass is being manufactured elsewhere for the concern but the assembling and metal work is being carried on here. A force of about twenty will be employed.

**Chicago's first annual exhibit of glass,** pottery, lamps and house furnishings closed February 18, after a successful run.

**Building contracts awarded in January, 1922,** in the 27 northeastern states exceed by 49 per cent the amount let in January, 1921.

**Representatives of the Window Glass Cutters' and Flatteners' Association,** after conferring with the wage committee of the independent machine window glass manufacturers, agreed to a 20 per cent wage reduction which went into effect on February 11, 1922.

## Personals

W. S. PHILLIPS has been engaged as general manager of the Liberty Glass Company, Clarksburg, W. Va., during the present fire. Mr. Phillips was formerly with the Brownsville Window Glass Manufacturing Company, Brownsville, Pa.

E. D. WINKWORTH, president of the Semet-Solvay Company, has been elected to succeed E. L. Pierce as president of the Solvay Process Company, Syracuse, N. Y., who resigned on January 31st. Mr. Pierce has also resigned as vice-president of the Allied Chemical Company.

MORGAN WING, for many years secretary and director of Wing & Evans, Inc., resigned on October 1, 1921. He has recently reorganized and become president of The Robert Wrench Co., Inc., of 71 Murray Street, New York, N. Y., manufacturers of the self-adjusting Robert Wrench.

R. G. SHERWOOD has been placed at the head of the inspection department of the Corning Glass Works, Corning, N. Y., the various inspection groups all having been centralized in one department with foremen in charge of each of four departments, which include 1, pyrex and miscellaneous ware; 2, railroad and marine ware; 3, bulbs and 4, electric tubing and cane.

## Warning Against Foreign Agents

The Department of Commerce announces that well authenticated confidential advices received from various sources indicate the recurrence in a virulent form of an old evil which has from time to time imperiled individual interests in the export trade but now seems to be directed against certain exporting industries as a whole. The means employed are to tie up the American exporter in an agency agreement and to push competing goods of foreign make under the protection of the existing agency arrangement.

This practice is not new but apparently it has never before been tried on so extensive a scale as it has attained from present indications, for which reason it is deemed expedient to issue a word of caution to American exporters. It is absolutely essential for the present prosperity and the future welfare of American export to exercise the most rigid scrutiny over the details of agency agreements which tie up the exporter in a certain territory to make sure that the agent is not bound by open or secret affiliations to interests other than American and that the agency agreement does not permit him to paralyze the active promotion of his agency interests and to devote himself actively to the sale of competing goods. The danger outlined is not a mere bugaboo but actually exists and flagrant cases have been submitted to the Department of Commerce as evidence.

## Foreign Trade Opportunities

*Further particulars may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C.*

794—An agency is desired by a merchant in Spain for the sale of optical goods of all kinds, barometers, thermometers and field, marine and opera glasses. Correspondence should be in Spanish or French. References.

845—An American having an established mercantile business in Australia is in the United States and desires to secure an agency for the sale of glassware (blown and pressed goods), etc. References.

888—A firm of contractors and engineers in India wishes to secure exclusive representation of manufacturers for the sale of window glass, chemicals, etc. No reference given.

## Inquiries Received

*For further particulars address* THE GLASS INDUSTRY.

57.—I intend to open an office in Seattle handling a complete line of high grade packers' and bottlers' ware. Can you give me a list of glass factories in the East and Middle West manufacturing machine-made ware, as follows: Milk bottles, complete line of flint wide and narrow mouth ware, soda and beer bottles, prescription ware, packers' tumblers.

58.—Please tell us who does etching of glass.

59. We want estimates on fire-proof structure to replace our factory destroyed by fire. Please send addresses of reliable concerns which can rush fabrication and erection.

60.—(From England) Please put us in touch with the inventor of the automatic vial necking and bottoming machine described in your November, 1921, issue, with a view to using the machines here.

**New Bill of Lading.**—The new form of bill of lading prescribed by the Interstate Commerce Commission to become effective March 15, 1922, will include "straight" and "export" bills which will be printed on white paper, the "order" bill on yellow paper, and the shipping order and memorandum acknowledgments on blue paper. Those having supplies of their own printed forms in stock showing firm name, etc., may use such forms after March 15 and prior to July 1, 1922, provided they are stamped as follows:

"This shipment is tendered and received subject to the terms and conditions of the company's uniform bill of lading, effective March 15, 1922. This receipt is not negotiable and if the shipment is consigned 'to order' must be exchanged for the company's uniform order bill of lading."

**Monthly Summary of Imports and Exports.**—On account of the adoption by the Department of Commerce of the new classification for exports of glass, glassware and other merchandise as explained in the February issue of THE GLASS INDUSTRY, the work of compiling the statistics has been delayed and the figures for January are not yet available.

## Current Prices of Glass-Making Materials

From quotations furnished by various manufacturers and dealers

**March 1, 1922**

| | | Carlots | Less Carlots |
|---|---|---|---|
| Alumina hydrate | lb. | .05½ | .06 |
| Alumina oxide | lb. | .. | .. |
| Antimony oxide | lb. | .08 | .08 |
| Arsenic trioxide (dense white, 99%) | lb. | .07–.07½ | |
| Barium carbonate | ton | 50.00 | 65.00 |
| Barium hydrate | lb. | .. | .. |
| Bone ash | lb. | .05½ | .06½ |
| Borax | lb. | .05¼–.05½ | .05½–.06 |
| Borax, fused, any mesh | lb. | .19 | .20 |
| Boric acid, fused | lb. | .35 | .35 |
| Cadmium Sulphide, red or orange | lb. | | 1.50 |
| Cadmium Sulphide, yellow | lb. | | 1.50 |
| Cobalt oxide ....in bbls. per | lb. | | 2.00 |
| Cobalt oxide ....in 10 lb. tins, | lb. | | 2.10 |
| Copper oxide, red | lb. | | .17 –.20 |
| Copper oxide, black | lb. | .23 | .26 |
| Copper oxide, black, prep'ed, | lb. | | .30 |
| Cryolite | lb. | | .09½ |
| Feldspar, 100 mesh | ton | 15.00 | |
| Fluorspar, powdered white, 95% | ton | 35.00 | |
| 90% | ton | 33.00 | 38.00 |
| Kaolin | ton | 17.00 | 25.00 |
| Lead oxide (red lead, $Pb_3O_4$) | lb. | .08 | .08¼ |
| Litharge (PbO) | lb. | .07½ | .07¾ |
| Lime— | | | |
| Hydrated (in 50 lb. paper sacks) | ton | 10.50 | |
| Burnt, ground, in bulk | ton | 7.25 | |
| Burnt, ground, in paper sacks | ton | 9.25 | |
| Burnt, ground, in 280 lb. bbls. per bbl. | | 2.00 | 2.05 |
| Manganese (85% $MnO_2$) | lb. | .04½ | .05 –.06½ |
| Nickelic Oxide (NiO) black | lb. | .45 | .50 |
| Nickelous Oxide ($Ni_2O$) green | lb. | .50 | .55 |
| Potassium carbonate— | | | |
| Calcined 90% | lb. | .06 | .07 |
| Hydrated 90% | lb. | .06½ | .08 |
| Potassium nitrate | lb. | .07½ | .08 |
| Powdered blue | lb. | | .24 –.26 |
| Powdered blue (std. formula) | lb. | | .38 |
| Salt cake, glassmakers, f. o. b. works | ton | 21.00 | .01½–.02 lb. |
| Selenium | lb. | | 1.95–2.25 |
| Soda ash, 58% dense, 48% basis | | | |
| Bulk | 100 lb. | 1.32½ | 1.47½ |
| Bulk, on contract | 100 lb. | 1.27½ | |
| Sodium nitrate, refined | lb. | .04½ | .05 |
| Sodium selenite | lb. | | 2.25–3.05 |
| Sulphur (flowers) | lb. | .02¼ | .02¾–.03 |
| Sulphur (flour, heavy) | lb. | .02 | .02½ |
| Uranium Oxide—100 lb lots | lb. | 2.10 | 2.25 |
| Zinc oxide (ZnO) | lb. | .08 | .09–.11 |

## Stock Quotations

(Reported by Moore, Leonard & Lynch, Frick Building, Pittsburgh, Pa.)

**Pittsburgh Stock Exchange—Feb. 28, 1922**

| | *Bid* | *Asked* | *Last* |
|---|---|---|---|
| American Window Glass Machine common | 76½ | 77½ | 77½ |
| American Window Glass Machine pfd. | 86 | 88 | 87 |
| American Window Glass pfd. | 97½ | 100 | 100 |
| Pittsburgh Plate Glass | 142 | 145 | 143 |
| U. S. Glass | 43 | 47 | 45 |

The stocks of Pittsburgh glass companies have been the strongest feature on the local market since last report. American Window Glass Machine common and Pittsburgh Plate Glass are up over ten points. In addition to its strength, the market has been much more active than in preceding months and all offerings of stock have been speedily absorbed.

**Wheeling Stock Exchange—Feb. 28, 1922**

| | *Bid* | *Asked* | *Last* |
|---|---|---|---|
| Hazel-Atlas Glass | 130 | 136 | 135 |
| Fostoria Glass | 120 | 125 | 120 |
| Central Glass | 100 | 125 | 125 |
| Imperial Glass | 95 | 100 | 100 |

Glass stocks, with the exception of Hazel-Atlas have been strong on the Wheeling Stock Exchange the past month. Hazel-Atlas declined sharply on heavy selling orders for a large western account. A. F. Brady, Jr., and J. H. McNash have been elected directors of the Hazel-Atlas Glass Company to succeed W. S. Brady and C. N. Brady resigned.

**Toledo Stock Exchange—Feb. 28, 1922**

| | *Bid* | *Asked* | *Last* |
|---|---|---|---|
| Owens Bottle Company common | 29¼ | 29½ | 29½ |
| Owens Bottle Company pfd | 98 | 100 | 98 |
| Libbey Owens Sheet Glass common | 100 | 105 | 102 |
| Libbey Owens Sheet Glass pfd. | 97 | 100 | 98 |

Market strong and active with pronounced strength in Owens Bottle common and Libbey-Owens Sheet Glass common.